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ORIGINAL COMMUNICATIONS.

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BRIEF CONSIDERATION OF CERTAIN RECENT VIEWS REGARDING OTOSCLEROSIS.*

DR. THOMAS HARRIS, NEW YORK CITY.

The study of that form of progressive hard-hearing known under a variety of names but most generally referred to as otosclerosis, is fraught with peculiar and to a large degree, uncontrollable difficulties. The affection is not like that of adenoids, something that can be got at and easily removed for examination. For accurate investigation, the microscopic examination of the temporal bones of those in whom the disease has been diagnosed during life is essential. The obtaining of these is difficult anywhere, as there is nothing *per se* in the disease which is wont to occur in the young, to hasten the death of the person affected, and especially difficult in this country where post-mortem material is so exceedingly hard to secure. An equally essential requirement, possessed by few otologists, is that of being well grounded in pathology. As a result, the total number of cases investigated is not large and these are almost entirely limited to those studied by our German confreres.

It is with no claim to any expert pathologic knowledge that I have presumed to present another paper on this subject, but rather that as a result of some personal study and of an opportunity recently to meet a number of those who have given especial attention to it I wish in a judicial way to weigh and consider briefly the various views which have been advanced regarding the nature of this dis-

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ease. I am fully aware that in the minds of many of you the subject appears hopeless of solution. Indeed, in one of the best short papers on the subject which has recently appeared, that from the pen of a member of this Society, Dr. Sheppard, the pessimistic view held by certain foreign writers was advanced, i. e., that even the diagnosis of otosclerosis is impossible.

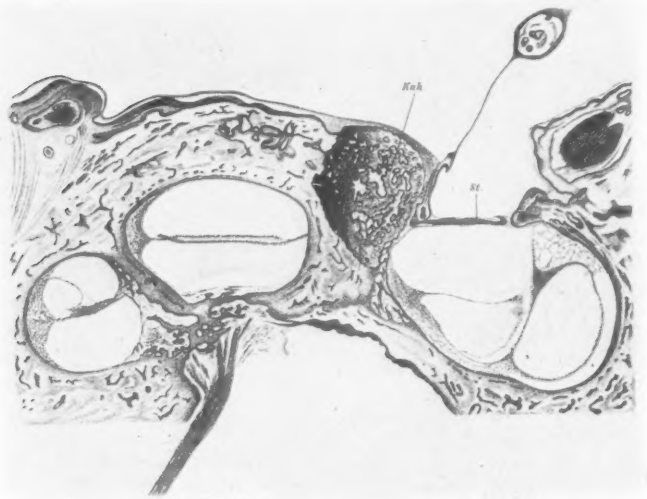


Figure 1—Case 1: Horizontal section through the region of the oval window. A small area of new-formed bone on the anterior border of the oval window. The mass is light in color near the window, darker in color near the cochlea. The last are the recent, the first are the older portions. The mass extends somewhat into the window niche, but does not involve the stapes nor the annular ligament. There is no stapes anchylosis. In the cochlea can be seen atrophy of the organ of Corti, and an atrophy of the connective tissue growth in the spiral ganglion. The atrophy of the acoustic nerve is the result of the tumor which existed in this region. The cochlea, the sacculus and the utriculus are filled with hyalin. (From Manasse's collection with permission.)

For a proper consideration of the subject, a brief reference to its history is necessary. The number of investigators is few, and the total number of cases, microscopically studied, collected by Denker up to 1904, is limited. The term otosclerosis, as you are aware, was first used by Joseph Toynbee, in 1857, in his descriptive catalogue of 1149 specimens, where he describes 126 cases of union of the stapes in the oval window. This term was used for many years to describe such an obstruction to the sound-waves whether of a mem-

braneous or bony nature. But it was not until 1885 that it was demonstrated macroscopically and physically by Bezold that the loss of hearing for low sounds was the result of such rigidity in the oval window. The first microscopic examination of a diseased temporal bone in a case of otosclerosis was made by Katz in 1890. He was followed by Habermann who, in 1892, reported his first case. In 1893, Bezold and Scheibe reported their first case, and in the same year, Politzer, in this country, and if we are not mistaken before this Society, reported sixteen cases, all observed by him during life and studied histologically post-mortem. In 1894, Bezold reported his second case; in 1898, Siebenmann reported four cases. In 1901, Scheibe reported two cases, in the same year Habermann reported a second case, and Katz a second case, while in 1903, Habermann reported ten temporal bones observed in six patients, a total of thirty-four cases. Since then Panse has reported two cases, Joergen Moeller one case, Bruehl five cases, Schilling one case, Otto Mayer one case, and most recently Manasse has described seventeen temporals in ten patients.

The early view in regard to the etiology of the affection was that it proceeded from a disease of the middle ear. This is undoubtedly correct in the cases of Katz, where both from the history and clinical picture, a previous chronic suppuration of the middle ear was evident. In those of Scheibe and of the ten cases of Habermann there is likewise a clear history of middle-ear disease. Politzer was the first one to advance the view, which he still maintains, that the disease is a primary affection of the labyrinthine capsule, originating not in the periosteum but in the bone itself. As a result, new bone-tissue is developed which gradually presses out the old bone and advances to the oval window and the stapes, leading finally to a complete stapes ankylosis. Siebenmann was the first to make a careful study of the affection and he is of the opinion that the spongifying process does not proceed from the periosteum, nor yet does it develop as a primary affection of the bone. From the cases which he studied he is of the opinion that the starting-point is to be found on the border between the labyrinthine capsule, which is primarily developed out of cartilage, and the connective tissue bone (Bindegewebesknochen) secondarily developed from the periosteum, and that the earliest stage of the disease is to be found in a lacunary resorption of the bone by means of the Haversian canals which become dilated into large lymph spaces, although at the same time in other areas there is apposition going on by means of osteoblasts. The spongification in his opinion is the last stage

of a growth which does not normally occur in the temporal bone, but is the rule in other bones, and follows here the entire disappearance of the cartilage present in the intercellular spaces and on the border of the oval and round windows and also by the growth of compact bone into the osteoid tissue, and finally into the spongified tissue.

Figure 2—Case 8: Advanced disease of the labyrinthine capsule. Almost the entire bony cochlea is transformed by the osteitic process. Only a small spot shows normal labyrinthine bone. N. L. K. We can see with this weak enlargement that the larger part of the new-formed bone is very old, light in color, poor in blood vessels, and formed out of dense sclerotic bone tissue. Only on the inner periosteum can be seen a few dark-colored recent portions. K. N. H. A small area of new-formed bone. Complete stapes anchylosis, with the foot-plate strongly involved in the new bone-formation, particularly on the posterior border. Degenerative atrophy in the membranous labyrinth, both portions of the acoustic nerve very thin. A. N. c. Atrophic cochlea nerve. A. N. b. Atrophic vestibular nerve. (From Manasse's collection with permission.)

Habermann, who studied the subject with equal care but with specimens derived from patients who had suffered from middle-ear disease, believes that the affection proceeds along the vessels from the middle-ear into the inner-ear. Finally, Denker, as a result of a study of the collected literature as well as personal investigation, in 1904, reached the conclusion that the disease might be in some cases secondary to middle-ear disease, but was usually of a primary nature, and recognized at that time the difficulties which have since presented themselves, due to the variable location in the labyrinthine capsule of the diseased areas. Since Denker's mono-

graph on the subject, the views of many investigators have been materially altered as the result of a masterly study of the subject by Manasse, of Strassburg, entitled, "Die Ostitis chronica metaplastica der menschlichen Labyrinthkapsel." Manasse previously in Basle advanced, but only last year published, this result of his studies in the examination of seventeen temporal bones derived from ten cases, a study extending over twenty years. As in the case of Siebenmann, the contributions of Manasse are particularly important because of the fact that he is a trained pathologist.

The views of Manasse it will be necessary to state somewhat particularly:

1. In the first place, he confirms the observations of Siebenmann and Habermann, that the predilection area for the diseased process is the anterior border of the oval window. This, however, as they have also pointed out, is not always the case. Three times the porus acusticus internus was involved, twice the round window, three times the apex of the cochlea, and once the anterior portion of the labyrinthine capsule and the posterior semi-circular canal.

2. Of particular interest are Manasse's views regarding the histology of this bone affection. He believes that the "disease is virtually a transformation of the labyrinthine capsule. The compact bone is to a greater or less extent replaced by new (foreign) bone substance which is everywhere sharply contrasted with the old bone tissue. The new bone differs in its structure according to the age in which one finds it. The chief difference, as compared with the old bone, is that instead of compact bone, a system of bony trabeculae is to be seen between which there lies a greater or less number of large open spaces. These spaces are composed in the younger parts of a tissue very rich in cells, which in the older parts becomes fibrous and at times is replaced by fat tissue or rarely even by 'Schleimgewebe.' The entire newly-formed tissue would be spoken of in general as *spongifying bone*. Later the open spaces become smaller. They contain, however, very little of real marrow, only blood vessels. The bone becomes much harder and denser, and develops a regular lamellae system, so that without doubt it can be regarded as compact bone, and can pass very rarely into a firm sclerotic bone entirely lacking in marrow and with few blood vessels."

Again quoting Manasse: "With exceptions, two forms of bone will be met with in the diseased areas, both representing in the majority of cases the early stages of the disease. First, small open

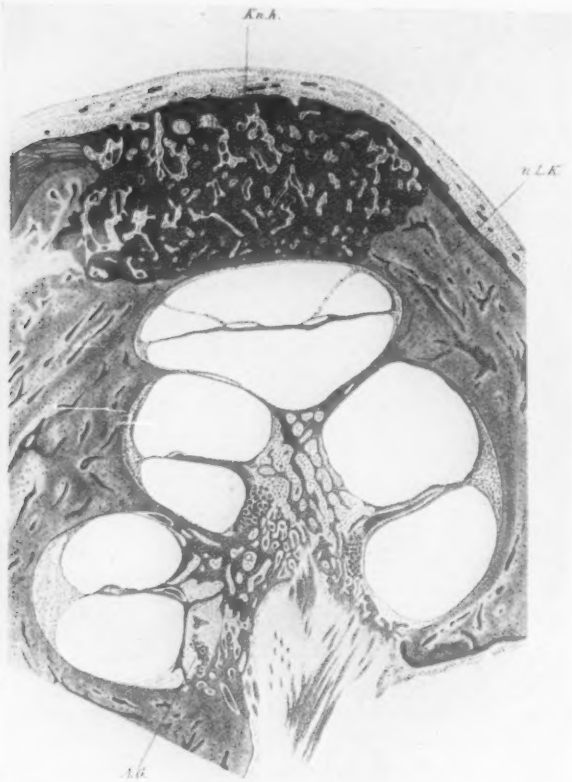


Figure 3—Case 10: Right. A section through the cochlea; circumscribed pathological area of bone. (K. n. h.), in the capsule extending to the cochlea. The transformed bone involves the entire thickness of the capsule from the periosteum of the middle ear to the inner periosteum of the cochlea. It is formed almost exclusively of recent newly-formed bone as can be seen from the dark color. In the membranous labyrinth, degenerative atrophy, in the organ of Corti, the spiral ganglion and in the fine ramifications in the cochlea. The sinking of the Reissner's membrane is not pathological but post-mortem. N. L. K. Normal labyrinthine bone. (From Manasse's collection with permission.)

spaces with pronounced bony trabeculae, coloring very bright with hematoxylin, and second, larger open spaces taking a darker stain and with fewer and smaller areas of bone between. The bright are the older diseased areas, the dark the newer. Neither is composed of compact bone, and as Siebenmann pointed out, both are lacking

in the intercellular spaces containing cartilage, which are characteristic of the normal labyrinthine capsule. The newer bone tissue shows between the thin, bony trabeculae large open spaces containing a tissue rich in round rells, cylindrical cells, and osteoblasts as well as osteoclasts. There are no large blood vessels, only capillaries, no compact connective tissue, no myoblasts nor red blood corpuscles, no fat tissue, and only a small amount of intercellular substance. The picture, as a whole, is one of granulation or new connective tissue, not of lymphoid marrow. Certain spots in the bone substance which take a deep blue color, are transparent, contain only small, three-cornered bone cells such as is met with in immature bone, and show a peculiar sieve-like rarefaction, the round, long or jagged holes of which are each filled out by a single cell. These holes often come together forming canals. They also contain capillaries and empty into the larger open spaces. Osteoblasts and osteoclasts are never met with in the narrow spaces of these deeply-colored bones. The older form of the new-formed bone is composed of larger bony trabeculae which take a brilliant red color and which form a distinct network. The bony substance shows both jagged and plump bone corpuscles, but no lamellae system. The open spaces contain few cells, often only one large, wide, thin-walled blood vessel, but also a fairly soft, connective tissue with lymphocytes, spindle-or star-shaped cells, and several vessels. This fibrous marrow passes occasionally over into the fat marrow and at times into the yellow marrow. Osteoclasts are met with more often in the larger areas than in the smaller. In the older parts of the large areas, the picture is one usually met with where the bone has been formed out of Haversian canals, but nowhere is there a reforming of the intercellular spaces containing cartilage.

We cannot go too deeply into the minute histology represented in Manasse's studies, but the question of the primary source of the diseased process must be referred to. Manasse thought for a long time that this was to be found in the osteoclasts which are seen in the perivascular connective tissue in the bone, but his more careful study showed him that the initial stage proceeds from the blood vessels themselves. The second interesting question is the origin of the sieve-like rarefaction which represents the most recent stages of the new bony growth. Manasse believes these minute openings to be where the bone corpuscles were previously found. As he remarks, this form of bone absorption is not unknown. M. B. Schmidt, among others, has carefully described this process. Manasse's conclusions are as follows: "The alteration of the laby-

rinthine capsule begins with the formation of osteoid and granulation tissue within the preformed blood-vessel spaces. The old bone is destroyed as the result of this new tissue growth by the simple process of compression, not through lacunary absorption, and the new bone tissue takes its place. This has only an intermediate character, in so far as it in turn is destroyed by two different methods of absorption. First, through a sieve-like rarefaction of the new bone tissue, and second, through lacunary absorption with

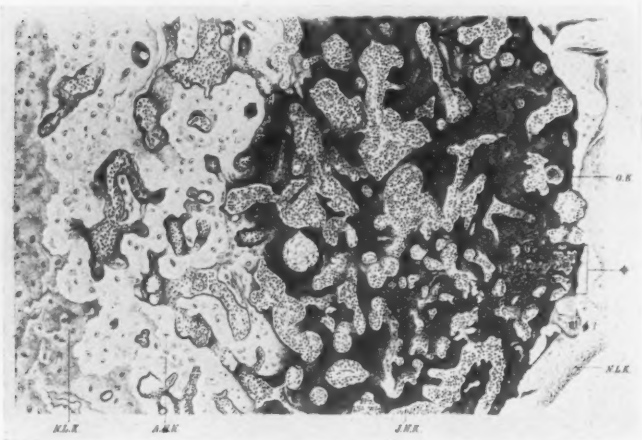


Figure 4—Case 1: Section through the portion of the new-formed bone lying near the cochlea. A stronger enlargement. We see on the left, the light-colored older portions of the new-formed bone. A. N. K. On the right, the dark-colored younger portions. J. N. K. Both are sharply separated from the normal labyrinthine bone. N. L. K. The former consists of dense bony tissue containing a few large vessels. The latter contains many more open spaces and many more cell element. At O. K. we see an osteoclast in the new-formed bone. Nowhere are osteoclasts to be seen on the border of the pathological and the normal bone. Here always the newly-formed bone substance crowds close on to the old labyrinthine bone without any cell elements. The star shows the cribriform rarefaction of the new bony growth. (From Manasse's collection with permission.)

the formation of osteoclasts. There follows a third deposit of bone in the marrow spaces as the result of osteoblast activity, which is at first spongified in character, and which does not disappear. As time goes on it becomes denser and harder and finally fibrous. The marrow spaces become smaller, the bony trabeculae always thicker, a lamellae system develops, and finally compact bone is formed which is always to be sharply differentiated from the old labyrinthine tis-

sue. The whole process is, to Manasse's mind, an inflammatory one, and he has accordingly named it "Ostitis chronica metaplastica der Labyrinthkapsel."

With these views most recent investigators agree, including Otto Mayer, Panse in his newly appeared "Pathology of the Ear," and Bruehl, except that Bruehl is not prepared to admit that the process is a true inflammation. Manasse does not, however, stop here, but in addition to the changes in the bone, describes changes in the membranous labyrinth and claims, based on his seventeen specimens where changes without a single exception are met with, that alterations in one or more portions of the sound-perceiving apparatus, namely, either atrophy in the organ of Corti, connective tissue deposit in the fine nerve filaments in the cochlea, similar changes in the spiral ganglion, or finally in the auditory nerve itself, are an essential part of the disease. He contends, indeed, that in every case of chronic hard-hearing of a high degree, whatever the cause may be, there are always the same changes in the membranous labyrinth He does not presume at the present time to say whether the bone changes cause those in the labyrinth, or vice versa, although in one of his cases, where the labyrinth was diseased on both sides but the patient heard better in the ear where the bone was not affected, he does not think the labyrinth could have been involved as the result of the bone disease.

From these views of Manasse regarding the membranous labyrinth, Bruehl vigorously, and it seems to us, with good reason, disagrees, or rather argues "not proved." In the first place, nothing is more difficult to determine than what changes in the membranous labyrinth are pathologic and what are post-mortem. The tissues are exceedingly delicate, and subject to post-mortem influences in the time elapsing after death, and from the processes adopted for their examination. This objection Manasse admits, and defines certain alterations found, as post-mortem and some, such as atrophy of Corti's organ, as pathologic. Further, it is impossible to positively show whether the change in the soft parts does not develop long after the original bone disease, and even as a result of the intercurrent affections, possibly acute, which carried the patient off. Bruehl, indeed, insists that such changes are in no way characteristic as they are met with in all severe affections of the middle-ear. Finally, it is too much to say that either clinically or anatomically they are always present. In two young patients recently examined by Bruehl, suffering from otosclerosis, the one 34 years of age, and the other 24 years old, there was no lowering whatever

of the upper tone-limit, while in a case just reported by him showing microscopically the characteristic bone changes, the organ of Corti was entirely normal. The most that we can assert, then, at present, is that changes in the membranous labyrinth are frequently, though not invariably present; whether they are a necessary part of the anatomic disease is yet unproved, but they are of sufficient importance to be always borne in mind. Functional tests showing nerve-deafness do not necessarily prove that the cause lies in the disease under discussion, but if slow in onset and if all other causes can be excluded, render such alterations in the membranous laby-

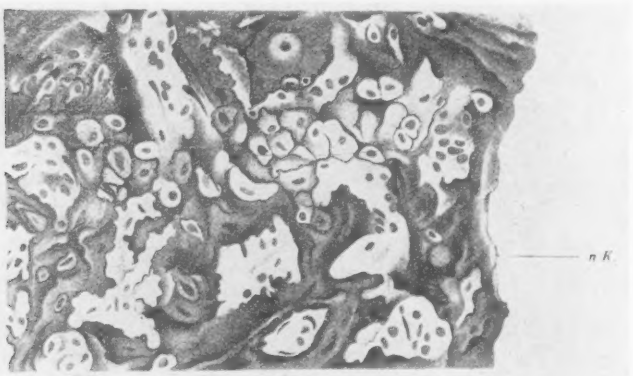


Figure 5: A higher magnification of the previous figure showing destruction of the new formed bone as the result of cribriform rarefaction The bone is very porous. A cell is to be seen in each cavity. In certain places the cavities have separating walls which are very thin. In other spaces these are lacking and they are confluent, forming streets or large spaces on the border adjacent to the normal bone. M. K. No cells are to be seen. (From Manasse's collection with permission.)

rinth highly probable. What is urgently required in order to throw more light on this difficult question are carefully studied temporal bones of young subjects in whom otosclerosis has been diagnosed clinically. This, as we said at the outset, is manifestly difficult. The one objection to Manasse's studies is that his specimens are chiefly from aged people where we should normally expect changes in the labyrinth.

Of far more interest to us as clinicians, than Manasse's histological studies, is his statement in regard to ankylosis of the stapes in his cases, and the deductions which he draws from this. In only three cases, five temporal bones, was ankylosis found. In the re-

maining twelve bones the joint was uninvolved. Manasse concludes, based on these findings, that anatomically speaking, stapes ankylosis can no longer be regarded as an essential part of the disease, nor even can it properly be said that these findings are due to the early stage of the disease, and that later there would have been such an involvement, for in two cases at least, the microscope shows

Figure 6—Case 5: Right. Section through the recent portions of large new bony growths. Extensive destruction of the dark-colored new tissue partly as the result of the Howschipschen, lacunae and osteoclasts (O. M.) and partly the result of cribiform rarefaction of the bone substance seen on the right-hand side below. On the left again new-formed bone. (From Manasse's collection with permission.)

the process to have been evidently an old one, which had stopped short of the stapes and the annular ligament. Manasse argues, furthermore, that even if stapes ankylosis is met with, it is impossible to say that it is bony in nature and due to the disease in question. He supports this contention by giving the histological findings of three cases of ankylosis, the first due to a lime deposit, the sec-

ond due to otitis media chronica adhesiva, and the third, a result of a general periostitis of the stapes and of the inner wall of the middle-ear. It is evident that whatever the cause of the ankylosis, the functional tests will be the same, and Manasse accordingly advances the view mentioned previously and shared in by Panse, that chronic progressive hard-hearing is not possible of diagnosis. We can readily understand how, with all that has been written to throw doubt on the subject, one can gain this pessimistic decision. We cannot, however, admit Manasse's contention. It must not be for-

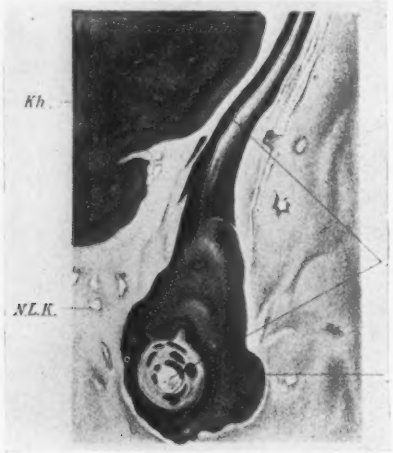


Figure 7—Case 4: Right. A higher magnification. Blood vessel in the bone (Kn. G.) Within the normal labyrinthine bone. (NI. K. M.) The vicinity of the new formed bone. (K. b.) On the outer wall of the blood vessel we see new-formed, very young bone tissue, (N. g. K.), which presses in the form of hummocks against the old bone and the blood vessel which are thus being caused to disappear. (From Manasse's collection with permission.)

gotten that "Ostitis chronica metaplastica der Labyrinthkapsel," so minutely and painstakingly described by him, is strictly an anatomic disease. It is undoubtedly true that it may develop in other parts of the labyrinth capsule than in the oval window, and in such cases may produce no symptoms unless the membranous labyrinth is involved, when the upper notes will be affected. It is undoubtedly correct to say that there are many such cases which have never been recognized. It is, however, the clinical manifestations of the disease which interest us and concern us alone, and it is only when the disease has advanced to involving the stapes and causes an im-

pairment or fixidity of that bone, that we can speak of it in a clinical sense. So it is proper to say that while there is an anatomic disease, there is also a clinical disease, and this, for a lack of a better name, will continue to be known under the name of *otosclerosis*.

While it is true that any form of ankylosis will produce the same functional tests, other causes than that due to a bone occlusion are so rare as to be excluded, although it must be borne in mind that such exceptions do occur. Panse states that he recalls a number of cases of deafness developing subsequent to confinement, which from the clinical course, the functional tests, the otologic pictures, and history of heredity, would have been regarded as otosclerosis. They, nevertheless, by use of the catheter and massage, made a marked and lasting improvement. Such exceptions occur and are constantly to be borne in mind in too promptly pronouncing the case hopeless.

To sum up, we feel that the pessimism in regard to understanding and diagnosing the disease is not warranted, and that while it is true that much is yet to be learned both as regards the histology and the etiology and that we can offer little for a cure so long as the latter is so obscure, we can confidently say that in the majority of cases, a determination of the disease is entirely possible. While nine years have elapsed since Denker's book on the subject, we regard his description of the clinical disease an eminently correct one:

"In the cases of progressive hard-hearing, which show an unchanged or virtually normal drum membrane, a patent Eustachian tube and the Bezold triad of symptoms, we may conclude that the pathological changes are only in the stapes and the annular ligament and in the bony areas bordering on the oval window. In the other cases where the funnctional test does not give the Bezold triad, but where there is a pronounced reduction of the upper hearing-limit, where bone conduction is not lengthened, and where the Rinné is not pronouncedly negative, there is in addition to the disease of the oval window an extension of the process further into the capsule of the labyrinth, or an involvement of the membranous labyrinth. While in most of the cases the mucous membrane of the middle-ear shows no change, in the cases of Scheibe and Habermann, and in those of Katz, the cause undoubtedly lay in a chronic middle-ear suppuration."

Consequently, as we took occasion in a former paper to point out, this or a similar middle-ear is not to be lost sight of in searching for a possible etiological factor.

104 East Fortieth Street.

THE TECHNIC OF THE LABYRINTH OPERATION.*

DR. EDWARD BRADFORD DENCH, NEW YORK CITY.

The various methods of opening the labyrinth are so well known, that it is hardly necessary for me to make very extensive remarks on this subject. It has occurred to me, however, that certain methods may be applicable to certain forms of labyrinthine disease, and for this reason I wish to call your attention for a few moments to the various methods which may be employed for opening the labyrinth for the relief of various labyrinthine conditions.

We have to deal with: (1) limited suppuration of the labyrinth; (2) diffuse suppuration of the labyrinth, with extension to the meninges, producing a meningitis; and (3) with certain non-suppurative conditions which may demand labyrinthine operation. I refer to those labyrinthine lesions, the prominent symptom of which is vertigo. Manifestly, the technic which might be required for the relief of a labyrinthine suppuration, the extension of which would terminate in meningitis, would be quite different from that required either in a case of circumscribed labyrinthitis or in a case where the labyrinthine lesion had never been suppurative, but had been a non-suppurative condition from the onset.

I shall describe, therefore, various methods of entering the labyrinth for the relief of certain pathological conditions: 1. A method for entering the labyrinth in cases of suppurative labyrinthitis, with probable extension to the meninges. 2. Methods of dealing with circumscribed areas of labyrinthine caries in which no general symptoms have been present. 3. A method of dealing with diffuse labyrinthitis with no symptoms of extension to the meninges. 4. Methods of opening the labyrinth in cases of chronic non-suppurative inflammation of the labyrinth, where the operation is performed simply for the relief of vertigo or, possibly, for the combined symptoms of vertigo and tinnitus.

For the first condition, that is suppurative labyrinthitis with symptoms of beginning meningitis, the best operation available at the present time is the one devised by Neumann. In this procedure the complete radical operation is first performed and the facial ridge lowered to its extreme limit. The dura in the middle cranial fossa is then exposed over the tympanic and tympano-antral roof, and the

*Read at the annual meeting of the Medical Society of the State of New York, Section on Eye, Ear, Nose and Throat, Rochester, April 30, 1913.

lateral sinus is exposed from a point just above the knee to as near the jugular bulb as possible. This leaves us a triangle, commonly known as Trautmann's triangle, bounded behind by the lateral sinus, above by the dura of the middle cranial fossa, and anteriorly by the ridge of the facial nerve. The dura is next carefully separated from the overlying bone in front of the sinus by means of a director and a protector, preferably the blade of a medium-sized curette, inserted between the dura and the bone. The bone overlying the curette is next carefully removed by means of the gouge and mallet, the strokes of the mallet being directed downward against the protector so as to prevent injury of the underlying dura. This procedure is carried regularly forward toward the facial ridge until the two limbs of the posterior semi-circular canal are opened. Next, three openings appear representing the two limbs of the posterior semi-circular and a transverse section of the horizontal semi-circular canal. The removal of bone is gradually continued forward towards the facial ridge until one of the openings of the posterior semi-circular canal becomes an elongated slit. This shows the section of the *ductus communis* between the superior crus of the posterior semi-circular and the corresponding crus of the superior semi-circular canal. A fine probe is then inserted into the cross-section of the canal and carried into the vestibule. The openings of the cross-section of the canal are then enlarged in the direction of the vestibule until free vestibular drainage is obtained,—that is, until the ordinary probe will enter the vestibule. This drains the static portion of the labyrinth. The auditory portion of the labyrinth is easily drained by removing the thin layer of bone between the oval and round windows by means of a small gouge. This operation is of use when a suppurative meningitis, resulting from a suppurative labyrinthitis, seems imminent. The removal of bone should be continued below the facial ridge until the auditory nerve at the internal auditory meatus, is reached. The incision of the dura in the immediate neighborhood of the internal auditory meatus will drain the primary focus of infection and, if the operation be performed early enough, may avert a fatal meningitis.

Unfortunately, while theoretically correct, the number of cures reported as the result of this operation are very few. In my own experience the operation has been devoid of value, as far as averting meningitis is concerned. As a method of draining a rapidly advancing purulent labyrinthitis the method is of great value.

In cases of circumscribed labyrinthitis, which are occasionally found at the time of the radical operation,—where a small, carious

area has been found in one of the semi-circular canals, usually the horizontal, and in which no labyrinthine symptoms have been present, or in which the only symptom has been the fistula symptom,—it has been my practice simply to curette the diseased area in the horizontal semi-circular canal, so as to remove all diseased bone, but not to open the canal so widely that the barrier which nature has erected for the preservation of the life of the patient is destroyed. Such a localized curettement of a semi-circular canal has been followed, in my experience, by absolutely no symptoms, and these cases have invariably terminated favorably. It has been my practice to carry a separate strip of iodoform gauze down upon the curetted area, in order to block this off as much as possible from the general radical cavity, so as to prevent subsequent infection of the labyrinth from the radical cavity. In one case of this character the curettement was extended so that the probe entered the vestibule through the external semi-circular canal. In this instance, the entire tympanic cavity was covered by an epithelial graft as well as the posterior mastoid cavity, and the gauze packing was brought out between these two grafts. This case made a perfect recovery, with no labyrinthine symptoms.

The method which I have practiced in draining cases of diffuse labyrinthitis, with no symptoms of extension to the meninges, is perhaps the simplest procedure. This consists in: (1) the performance of the ordinary radical operation, with lowering of the facial ridge to its extreme limit; (2) the horizontal semi-circular canal is opened at its most prominent portion, and a probe inserted into its lumen. By chiseling downward and slightly backward, so as to avoid the facial nerve, the vestibule may be entered. Drainage of the cochlea is performed in exactly the same manner as described in the previous operation, namely, by the removal of the thin lip of bone separating the oval and round windows. This, of course, opens the first and second turns of the cochlea.

Two other methods of entering the labyrinth have been attempted in work upon the cadaver, for the purpose of finding out whether, in cases where the static labyrinth might require operation for the relief of vertigo in non-suppurative cases, a simpler operation is not available. In these cases we are operating in a practically sterile field, and unless the case is infected at the time of operation, or unless, as might happen, the area of operation is infected through the Eustachian tube, the conduct of the procedure should be possible as a thoroughly aseptic operation. It is perfectly possible to open the vestibule thoroughly below and behind the prominence of the

horizontal semi-circular canal, without performing the radical operation. The procedure is rather difficult, and the field of operation contracted. I have never performed the operation upon the living subject, but from work done upon the cadaver I believe that the vestibule can be opened and thoroughly curetted in this way. This procedure should be of value in cases of aural vertigo which resist all other methods of treatment.

Another means of entering the labyrinth which has appealed to me in experimental work is that of entering the vestibule through its superior surface. In this operation, the horizontal semi-circular canal is exposed as the result of a complete mastoid operation. The mastoid operation should be continued so as to thoroughly expose the zygomatic cells, in this way giving a broad exposure of the tympano-antral roof. Such an exposure is necessary for the perfect conduct of the operation. The dura is next exposed in the middle cranial fossa by the removal of the tympano-antral roof. The bone covering the dura is next removed directly inward until the prominence of the superior semi-circular canal appears. This eminence is easily demonstrable if the dura is carefully raised from the surface of the petrous pyramid by means of a thin retractor. If, now, the gouge is applied over the prominence of the horizontal semi-circular canal and the superior surface of the petrous pyramid removed,—that is, if the superior wall of the horizontal semi-circular canal be removed and this removal is continued along the superior surface of the petrous pyramid,—the superior semi-circular canal will be opened. Removal of the fragment of bone which comprises the roof of the superior semi-circular canal will open the roof of the vestibule. The use of the curette in this region will then enable the operator to thoroughly destroy the canals and the terminal filaments of the auditory nerve lying in the superior and horizontal canals as well as in the vestibule. Similarly, the posterior canal may be thoroughly extirpated along the lines already laid down in the Neumann operation, that is, leaving the tympanic contents intact.

This operation appeals to me as possibly the ideal one in dealing with cases of aural vertigo due to a non-suppurative labyrinthine lesion. I have not performed the operation upon the living subject but its performance upon the cadaver is so simple as to recommend it in cases where we are operating in an aseptic field. Such an operation thoroughly destroys the contents of the horizontal canal, the superior canal, and the vestibule, and should be the ideal operation in cases of this character. Moreover, this operation can be performed without a preliminary radical operation. In other words,

it can be accomplished through the ordinary mastoid operative field if the operation is made to include the zygomatic cells, without taking down the posterior wall of the external auditory canal, that is, without the performance of the ordinary radical operation.

These last two procedures, naturally, do not permit of any interference with the auditory portion of the labyrinth.

If the cochlea is to be opened, it is imperative, in most cases, that the complete radical operation be done in order that the operator may obtain a perfect view of the promontory and to enable him to remove the bony wall of the first and a portion of the second turns of the cochlea, by taking down the bridge of bone which separates the oval and round windows. Such an interference with the cochlea would not be necessary in cases suffering simply from vertiginous symptoms.

I believe we are about to arrive at a point where labyrinthine exploration will be a procedure of election in certain cases of impairment of hearing, progressive in type and involving the labyrinth. This remark is more in the nature of prophecy than along the lines of clinical experience, but I sincerely hope that at some future meeting I may have something to say regarding procedures of this character, having for their object improvement of impaired hearing in cases which have otherwise resisted all efforts on the part of the surgeon.

15 East Fifty-third Street.

Foreign Body Tolerated in the Esophagus for Twenty-seven Days Without Marked Reaction. G. LIEBAULT, *Revue hebd. de Laryngol.*, April 5, 1913.

The foreign body was a plate, holding artificial teeth, which was located in the esophagus by means of the esophagoscope. Efforts of removal by the buccal route proved so difficult that a retrothyroideal laryngotomy was planned, when the foreign body was finally removed by the esophageal forceps. In spite of the prolonged pressure of the foreign body there was very little sign of irritation and no abscess or suppuration. SCHEPPEGRELL.

THE DIAGNOSIS OF RUPTURE INTO THE LATERAL VENTRICLE AND OF ACUTE INTERNAL MENINGITIS.*†

DR. ERICH RUTTIN, VIENNA.

A brain abscess, especially a temporal lobe abscess, can lead to meningitis in various ways. The most fatal way is through rupture of the abscess into the ventricles, causing thereby an instantaneous flooding of all the cavities and recesses of the brain (pyocephalus internus) and a quick spreading of the suppuration to the meninges. These cases run such a rapid course and manifest such severe symptoms that present-day therapy is almost powerless to combat them. It is, therefore, very desirable to diagnosticate this occurrence with certainty, the more so because statistics teach us that this is the most frequent cause of death associated with temporal lobe abscess.

I have observed a seemingly constant symptom in acute pyocephalus internus. This consists of a very pronounced vertical nystagmus directed upwards. The following three case-histories support my observation.

Case 1: Theresa Ch., 20 years old; servant girl. Nothing is known concerning the patient's previous history. She was admitted to the Urbantschitsch Clinic, November 19, 1911, in a somnolent condition, at which time I made the following examination: Left ear, atrophic scar. Right ear, chronic, fetid suppurative otitis media. Hearing in the right ear (tested with the noise apparatus) shows conversation voice *ad concham*. Weber to the right. Rinné negative on both sides. Bone-conduction somewhat lengthened. c_4 on both sides +; C_1 on the right side —, on the left +. The statements of the patient are not very reliable, owing to her somnolent condition. Caloric reaction on the right positive, but weak. Fistula symptom + with tremulous but distinct eye movements. No spontaneous nystagmus. The mastoid process is not tender to pressure, except at a point below the antrum. Paresis of the left lower extremity, loss of patellar and abdominal reflexes on the left. Pupils equal and react to light and accommodation. No paresis of the eye muscles. Cranial nerves free. Dermography +; Kernig

*Read at the meeting of the German Otological Society, Hanover, May 22-24, 1912.

†Translated at the request of Dr. Ruttin, by Dr. Irving Wilson Voorhees, New York City.

+; neck stiff; tenderness on pressure of the eye-ball; photophobia; tenderness to pressure over the vertebra; abdomen retracted; no ataxia; eye grounds normal. Pulse 90; temperature 39°; apathy. Lumbar puncture gave a diffuse, cloudy fluid under high pressure. There were numerous polynuclear leucocytes but no bacteria.

I therefore made a diagnosis of temporal lobe abscess and operated at 11 o'clock that night. In the mastoid cortex I found a fistula the size of a hemp seed. There was a small subperiosteal abscess. The mastoid process was sclerotic. The antrum was very large and filled with fetid pus. The typical radical operation was performed. The dura of the middle fossa was slightly under tension at one point, but incision in three directions was negative. After several trials, very fetid pus under high pressure escaped from the posterior part of the temporal lobe. The evacuation occurred very suddenly and collapse followed, which, however, was overcome through artificial respiration.

November 11: Paresis of the extremities had disappeared. The reflexes were again present but difficult to elicit. The other symptoms were the same, especially the Kernig and the stiffness of the neck, which were pronounced. Vertical nystagmus upward. Temperature, 39.1°; pulse, 100. November 12: Temperature 37.8° and 39°; pulse, 90. November 13: Temperature 36° and 39°; pulse 84. The eye-ball is sensitive to pressure and light; pupils equal and react. Neck stiff and tender. Trousseau; Kernig +; all reflexes present but elicited with difficulty; consciousness benumbed. It was easy to awake the patient, but she fell into stupor again very quickly. Sensation present; also deep sensibility; no unilateral paralysis; strength of the hand-grips about equal; vertical nystagmus upwards. Upon changing the dressing, fluid escaped. November 14: Temperature 38.3° and 39°; pulse, 84. November 15. Exitus.

Post-mortem findings. (Pathological Anatomical Institute, Hofrat Weichselbaum). A temporal lobe abscess, the size of a walnut, putrid contents and perforation in two places in the right lower horn of the lateral ventricle. Suppurative meningitis with a trifling amount of exudate. Parenchymatous degeneration of the heart and kidneys. Fatty degeneration of the liver. Radical operation on the right middle-ear with drainage of the abscess five days ante-mortem.

Case 2: J. H., age 40 years; life insurance agent; admitted March 5, 1912; anamnesis. Patient suffered an attack of "Fraisen"

in childhood, otherwise he does not remember any other diseases. At the age of 19 he had discharge from the right ear. At times there was a marked suppuration. Four or five weeks ago he suffered a recurrence of this marked suppuration in the right ear. There is burning and sticking sensations in the right temporal region and in the vertex. No headache; no noise, and until now the patient was very seldom under the care of a physician. He was advised by a specialist to come to the clinic for operation. He cannot remember any secretion from his left ear. His hearing-power on the right is diminished. His internal organs are sound. No venereal disease. In early life the patient was a hard drinker.. Fourteen days ago, suddenly, during the night, the lips became drawn toward the left and he could not shut the right eye as well as the left.

Present condition, March 6, 1912. Facial paralysis on the right, especially noticeable at the angle of the mouth. Left ear perforation of Shrapnell's membrane. In the depths of the right ear of the canal, a broad, prominent, large, grayish-red, easily bleeding polyp taking in almost the entire lumen. There were also a few granulations below. The secretion was very trifling. Mastoid process not tender to pressure. Conversation voice on the right, 5 to 10 cm. On the left, + 7 cm. Whisper-speech on the right not heard; on the left, 4 m. (All tests by the noise apparatus.) Weber in the head; Rinné on the right —; on the left +. Schwabach on the right, somewhat lengthened; on the left, normal. C_1 heard on the right by strong stroke; on the left, by slight stroke; c^4 on the right heard only by a strong stroke; on the left by a slight stroke; no noise; no dizziness. Spontaneous nystagmus present; fistula test negative; caloric reaction on the right, weak; on the left, strong. Temperature, normal.

March 11, 1912: Operation (on the right) by Prof. Urbantschitsch. Typical radical operation. Many polyps in the tympanic cavity. At the point where the facial ridge lies below the horizoneal canal, there is a rough fistula, not in the semi-circular canal. Palpation of this spot elicited lively facial twitchings. The fossae of the skull were not laid free. Plastic after Panse. Wound dressed.. Temperature 38.4° and 38.2°.

March 12: Temperature 38.2° and 38.8°; March 13: Temperature 37.8° and 38.2°; March 14: Temperature 36.7° and 37.2°; March 15: Temperature 36.4° and 36.8°; March 16: Temperature 36.4° and 36.1°. Dressing changed. Removal of the wound clamps. No reaction in the wound. March 17: Temperature 36.5° and

37.6°. Normal course. No increase in temperature. March 20. Patient was dismissed to the Out-Patient service with a satisfactory granulating wound. March 30: Patient came for dressing. Looks very pale; complains of headache and dizziness. Nothing special to be seen in the wound. However, the fistula symptom is very marked. Hearing (with the noise apparatus) present. No spontaneous nystagmus. The patient was advised to come immediately into the hospital; he came on the next day.

April 1: Readmission. Temperature, 37°. General condition as on March 30. April 3: I was called at 5 o'clock in the morning, when I found the patient, whom I had not observed previously, semi-conscious; very restless; stiff neck, abdomen retracted; Kernig; dermography; in short, all signs of meningitis. There was *marked vertical nystagmus upward*. Upon the presence of this symptom, I immediately made the diagnosis, rupture of a temporal lobe abscess into the ventricle with acute internal meningitis. Patient died the same night.

Post-mortem Findings:—Assistant, Dr. Schopper. Chronic suppurative otitis on the right with rupture of the pus through the tegmen antri into the brain and formation of an abscess the size of a hen's egg in the right temporal lobe; extensive softening and punctate hemorrhages into the ependyma of the right lateral ventricle. Pyocephalus internus, the result of rupture of the abscess into the posterior horn. Chronic emphysema of the lungs. Catarrhal bronchitis both sides. Moderate dilatation of the right ventricle; hypertrophy and clefting of the tonsils. Hyperplasia of the follicles at the base of the tongue in the spleen and intestines. *Etat mamelloné*. Bacteriologic examination of the pus showed mixed infection.

Case 3: M. Pat., age 23 years. Admitted on April 3, 1912. Patient was brought into the Clinic by her doctor with the diagnosis of meningitis. She had suffered for several years from right-sided aural discharge. Temperature 39°. Left ear normal; right ear, total destruction of the drum. Cholesteatoma in the attic with destruction of the lateral attic wall. Tympanic cavity filled with granulations; tip of the mastoid process tender to pressure.

Conversation Voice:—(Tested with the noise apparatus), *ad concham*. Weber to the right; Rinné —; bone-conduction lengthened $C_1 = 0$. $c^4 = 0$. Rotatory spontaneous nystagmus towards both sides; stronger toward the left than toward the right. No fistula symptom. Caloric nystagmus prompt.

Operation, April 10, 1912, by Assistant Beck. In the antrum there was pus under high pressure. Cholesteatoma in the attic and antrum; dura of the middle fossa exposed about the size of a lentil slightly changed. Semi-circular canal rough, but no fistula present Behind and above the horizontal semi-circular canal, several large necrotic cells were found into which the cholesteatoma had grown. Curettement. Typical radical operation. Plastic after Panse. Wound dressed.

April 12: Condition good but temperature 38.3°, falling in the evening to 37.3°. April 13: Temperature normal. Condition good. Appetite good. April 14: Temperature normal; condition good. April 15: At 4 o'clock in the afternoon, the nurse brought the information that the patient, who had hitherto been feeling quite well, suddenly collapsed and complained of severe pain, especially in the back of the head.

Examination:—Patient reacts when called (noise apparatus applied to the left ear). Lips pale; pulse small, arhythmic, bounding, 128. Sensorium clouded; Kernig +; neck tender to pressure; left upper extremity relaxed; left patellar reflex increased; lumbar puncture cloudy. Fluid contained isolated gram-positive cocci. Temperature 38.1°; strong vertical nystagmus upward. In spite of the fact that I had not previously seen the patient, on account of this nystagmus I made an immediate diagnosis of pyocephalus internus after rupture of temporal lobe abscess. Colleague Beck immediately enlarged the exposure of the dura in the middle fossa and found the same somewhat discolored and under high tension. However, the incision of the dura and puncture of the temporal lobe with the scalpel in various directions was without result, also exploration with the forceps. On this account the dura of the posterior fossa was also laid bare but was not incised since it appeared normal. On the evening of the same day the patient died.

Post-mortem findings:—Assistant, Dr. Schopper. An abscess about the size of a walnut surrounded by a pyogenic membrane was found at the base of the right temporal lobe. Rupture of the abscess into the right lateral ventricle and pyocephalus internus. Radical operation; opening of the right middle fossa with incision into the temporal lobe about 1 cm. lateral to the abscess. Leptomeningitis spinalis with especial localization of the exudate at the base of the brain, in the region of the pons and the medulla as well as on the surface of the cerebellum. Slight parenchymatous degeneration of the myocardium. A trifling endocarditis of the mitral valve; passive congestion. Status lymphaticus.

The explanation for this phenomenon can only be hypothetical. I had already observed vertical nystagmus in a tumor of the corpora quadrigemina, and remembered opportunely rupture into the lateral ventricle. In the literature I found also statements which led to the assumption that there was probably an irritation of the quadrigeminal region. Nothnagel mentions a case of Henochs in which the left posterior quadrigeminal body was destroyed. Both eyes were directed strongly downward. There was lateral movements of the eyes, which could not be turned upward. Later, convergent strabismus occurred on the right and was, without doubt, to be considered in association with the meningitis. In this case it must be assumed that something took place which had a certain relationship with the vertical nystagmus, since we must assume an analogy to our experiments with horizontal nystagmus in which pathologic changes which produce vertical nystagmus upwards can bring about among other changes, deviation of the eyes corresponding to the slow component of the nystagmus downwards. Moreover, the assertion of Monakow appears to me in this connection worthy of mention. "In diseases of the quadrigeminal bodies, most cases show only partial limitations in the combined movements of the bulb, and especially of the movements upwards and downwards, less so from side to side." However this may be, we have at any rate, in the sudden onset of vertical nystagmus, a valuable symptom of acute pyocephalus, and since this, as we have seen above, is the most frequent form of meningitis after temporal lobe abscess, we may immediately make the diagnosis from the severe vertical nystagmus, and also the sad prognosis of rupture into the ventricle. On the other hand, we must take warning in a case of temporal lobe abscess showing this symptom, since, unfortunately, rupture into the ventricle or infection of the ventricle through a thin partition, even after opening the abscess, is quite frequent.

Edema of the Glottis. G. K. Collier, *N. Y. Med. Jour.*, May 3, 1913.

The unusual features in this case are glottic edema with epilepsy and the speedy, fatal course of the disease—two years. Tracheotomy was tardily performed after unsuccessful attempts at intubation. Ed.

VERTIGO.

PROF. DR. PAUL FRIEDRICH, KIEL, GERMANY.

There are variable sensations variously described by physically normal individuals under the term of vertigo. One person will describe vertigo as a sensation resembling that which he had on looking into a ravine, or that of an unexpected glance downward from a high tower; another recalls a ride in a merry-go-round; the third recounts the sensations of discomfort and uncertainty experienced in a suspension car; and the fourth compares it to the vertigo felt on landing after a stormy sea-voyage. The productive factors of vertigo are as varying as are the descriptions of it.

The dweller in the valleys experiences these unpleasant sensations when mountain-climbing. The thought that he might fall into the depths, disquiets him and this compelling force grows almost irresistible. It overpowers him even though the path may be protected by a hand-rail which eliminates all chance of falling.

This forced sensation, associated with discomfort and fear due to altitude-vertigo is produced by the novelty of the surroundings. The lowlander on his first mountain trip is unable to appreciate the relative depths and heights and the changing views. These unaccustomed optical impressions disturb his habitual ideas of space and produce a vertigo which in turn deranges his bodily equilibrium. The optical impressions are augmented by the unaccustomed walking on a steep path. Climbing brings into action other muscles and the position of the body in walking upward is different than when walking on level ground. The body must adjust itself to the changed attitudes and movements so that its equilibrium is preserved. Bodily statics and dynamics must become adjusted at each changing attitude if vertigo is to be avoided.

Let us consider another example: Why is a passenger in a suspension car or airship seized with dizziness and why does the same passenger riding under the same external condition of stability in a railway car experience a feeling of certainty and pleasure? There, too, he is safe from falling. The maintenance of equilibrium is not disturbed by any movement of the body.

From this stationary point of observation the eye becomes accustomed to the rising and falling landscape, but in spite of this the upward and downward motion causes dizziness. This sensation

continues even when the eyes are closed. That organ which is involved in this instance is the one which gives us the sense of orientation when impressions of sight, touch and muscle senses are excluded. It is the organ which has its seat in the semi-circular canal apparatus.

From this we gather that by vertigo we understand those sensations occurring when the organs which preserve our equilibrium and our sense of orientation are disturbed.

This complicated process is not due to one single organ, but to a whole system of sense organs which all function systematically under the control of a superior sense organ. Through them we are conscious of our position in space and of any changes in position and movements and through them our bodily equilibrium is maintained by purely unconscious mechanical, muscular action. Among such sense organs we may class the external and internal sense of touch with its corresponding muscles, the sense of sight and eye muscles and that static organ which is situated in the semi-circular canal apparatus.

We know that all our impressions are formed from previous impressions that through repetition become imprinted so that the slightest stimulus will reproduce them unconsciously.

Where impressions are formed by a combination of different perceptions, all of the contributing sense organs may be aroused by stimulating just one organ. It is characteristic that we can no longer isolate the single sense stimulations but that all the senses combine to produce a composite impression in which we cannot recognize the individual phases of the various impressions.

This combined system reacts unconsciously as a whole when any one of its component parts is stimulated.

The separate apparatus which maintain our equilibrium and prevent dizziness must be regarded in the light of a system combining to work in unison. The various impressions made upon the peripheri of the several sense organs are conveyed to a central organ which probably has its seat in the medulla.

Impressions resulting from a stimulation of the touch organs, the sense of sight and the semi-circular canals differ in their specific sense energy, but all combine in the function of sustaining the equilibrium of the body.

As has been said, the co-ordinates of the various impressions are combined into a single result. For example, we do not note the isolated tone or character of a single instrument in an orchestra, but are aware only of a harmonious whole which leaves an impres-

sion of a unified, inseparable ensemble. The whole system of organs of equilibrium is controlled from a centralized point in which the various routes meet but the separate organs stimulated at certain points along their individual routes may set the entire system into action, because the single organs are in constant communication.

For this reason we notice the same result whether the equilibrium is disturbed by a stimulation of the touch sense, sight organ, semicircular canals or central organ. The stimulation will always pass through the whole co-operating system.

For example, a stimulation of a touch organ or muscle is communicated to the eye and semi-circular canal and these will respond in their habitual co-operative manner.

On the other hand, it follows in this closely associated system, that a single deficiency along any one route will affect the whole system. Equilibrium is at once disturbed. Vertigo results as soon as one of these single organs working in combination fails to function. With this premise established, I shall discuss the single factors which affect the sense of bodily equilibrium and our orientation in space.

The exterior sense of touch controls our impressions of our position in space as well as ideas of pressure and temperature.

The touch sense determines our ideas of the pressure of the support under us when reclining and the changing pressure on the various parts of the body makes us aware of the form of our own body as well as the form and material of the support. The newborn child is minus these impressions and only by exercise does he gradually develop unconsciously those brain centers which control the ideas of position of the body and its members and his sense of orientation. A more complicated process develops when the child learns to sit erect and to walk.

The touch sense comes into play now and that of the sole of the foot is of utmost importance in standing and walking. We recognize this easily when our toes come into unaccustomed or partial contact with the floor and cause us to totter or when we lose equilibrium in standing on an unsteady base. Walking in bare feet may at times produce uncertainty due to the unusual touch sensations which are strange to the clad foot.

However, the external sense of touch is not alone able to regulate our complicated movements. These are also influenced by an internal touch sense, which comprises those impressions, gained also through practice and controlled by the musculature of the

body, the ligaments and joints, all of which we designate as the kinesthetic apparatus.

The young child learns the movements of his body through his muscles, ligaments and joints, since the inner touch sense is stimulated by single movements which arouse associations in the central organ. These, through constant practice, cause an automatic co-ordination. Thus systematic co-ordinated movements are acquired which in their impulse are influenced by the will but which in their execution are entirely mechanical.

This unconscious and purely mechanical process is first noted when we make movements that are unlike those associated with distinct impressions which we perform unconsciously.

No matter how securely we usually walk, we are unsteady as soon as we undertake a new method of locomotion. Walking on stilts illustrates the point. New groups of muscles must become adjusted in order to make walking possible with these elongated legs. The readjustment of equilibrium requires other musculature; the arms find support at the sides of the stilts and the rump muscles restore balance. A large number of instances might be cited to show that new movements performed under changed exterior conditions can only be acquired through practice. When this practice is lacking, disturbed equilibrium and unusual movements are the result. Gymnastics, tight-rope walking, and balancing must be practiced as well as bicycle riding, which requires a special adjustment of equilibrium, which, after it has been learned, acts automatically.

The foregoing remarks lead to the conclusion that lack of practice and adaptation of the internal and external touch sense cause uncertainty and giddiness that result in purposeless movements, defeating the desired result. Instead of sustaining equilibrium, they add to the unsteadiness of bodily statics and dynamics. The inexperienced ice skater, in trying to maintain his equilibrium, increases his dilemma by misdirected movements and only his fall restores his balance, because the accustomed stimulation of centers which control orientation in the reclining posture re-establishes the relation of the various parts of the body in space.

All of our movements are controlled by the eyes. We accustom ourselves to sight impressions in space and adjust the kind and direction of our movements to them.

Sudden changes in our surroundings through false estimates of space produce wrong impressions of our static relations. When riding in a train the landscape seems to be moving and we appear to be stationary until the train suddenly halts and produces in us an

unpleasant feeling of lack of orientation. While our train remains standing, a train moving in the opposite direction, produces in us the feeling that it is we who move. When this train has passed by, our eyes receive an annoying, jolting impression of our position and instead of the moving train we see the stationary objects about us. An optical illusion may thus produce dizziness even when the body is in repose and when no movement of the body has given cause for disturbances in equilibrium.

Sensitive persons may experience equilibrium disturbance when obliged to pass over a bridge in walking along the road. The road appears to be a dam from which the ground slopes away to increasing depths. The eye looks beyond such depressions that seem to connect with the lower strata, and receives the natural impressions of this space. This optical association is suddenly lost when we reach the bridge and see the depths below. The surface impressions are changed and the flowing current and other objects in the valley below appear in different proportions than those to which the eye is accustomed. With this we receive a false impression of space, and we are overcome by the uncertainty in the estimate of the static relations of our own body to space. The results of such optical impression is an unsteadiness of movement, a groping waik, and an erroneous relation between the roadway and the depths below. This most frequent type of vertigo we term *altitude vertigo*. Hitzig ascribes this to a diminution of static sensibility; Wollenberg attributes it to our helplessness in estimating our relation to space.

There are two phases of altitude vertigo: mountain vertigo (Bergschwindel), tower vertigo (Turm-schwindel). Huguerin describes the sensation of altitude vertigo as follows: The first glance into the depths causes a peculiar sensation in the legs, as though the base on which the individual stands firmly were sinking, the legs tremble, the body sways and were it not for a firm support, the subject would pitch downward. This sensation disappears upon closing the eyes.

Fear of the possible consequences of such a fall accompany the impression that the base is giving away. A slight attack of altitude vertigo may develop after climbing a spiral stair in the interior of a tower and stepping onto a platform or balcony and suddenly glancing downward.

The pleasure which such a bird's-eye view gives to the observer who is free of altitude vertigo changes to a distinct feeling of discomfort in one who is subject to such vertigo. It remains with him until he is again on terra firma.

The above-mentioned sense organs, the tactile impression and sight, do not wholly account for the preservation of equilibrium. We can walk securely and perform complicated movements in the dark without the aid of the eyes in the maintenance of equilibrium. For this reason we cannot consider sight essential to prevent attacks of vertigo or loss of equilibrium.

In the water when diving or swimming we have no stimulation of either our sense of touch or sight to aid in the orientation of the body, and notwithstanding we are aware of the position of the body in space and are able to assume either a vertical or horizontal position. Accordingly we can also exclude the impressions gained from the tactile sense in the preservation of equilibrium.

The organ which assists in orientation is situated in the labyrinth and in that special part called the semi-circular canals which we must look upon as the sense organs which receive the impressions of position and movements of the head, thereby the head becoming the chief center of orientation for the whole body.

The position of the head influences our appreciation of our position in space. When the normal head position is changed through bending, lowering, or turning, the localized sense of equilibrium situated in the head becomes active; it signals to the remaining organs of equilibrium that the position of the head has changed, and accordingly the tactile and sight senses are obliged to react to this stimulation.

The semi-circular canals indicate the position of the head as well as that of the body, which is determined in the co-ordinated muscle action of the entire body. Certain gymnastic exercises prove that a change in the position of the head can produce equilibrium disturbance, unsteadiness and vertigo. Sensitive individuals experience vertigo in various calisthenic exercises executed with eyes closed.

The semi-circular canals make us aware of the horizontal and vertical position of the body as well as upward or downward movements.

How can we otherwise explain the sensation of ascending and descending when in a closed elevator with the body perfectly at rest than by an organ that unconsciously influences orientation? How else could we explain such sensations as diving or the turning of a somersault without other influences?

The semi-circular canals are so closely linked to the organ of hearing and because of the nerve trunk which they share in common, so bound up with it that the older physiologists believed it the

seat of the hearing function. The arrangement, however, of the semi-circular canal apparatus into a geometrically co-ordinated system of triple planes suggests the probability of an independent organ which interprets the three dimensions of space: height, depth and breadth.

Long and wearisome experiments upon animals were necessary to establish a scientific basis for the study of the static function of the labyrinth. The experiences gained through observing animals were substantiated by observing the human who suffered from similar disturbances of equilibrium. One hundred years ago, Flourens noted peculiar disturbances in locomotion in doves whose semi-circular canals he had removed. Much later, experiments upon animals were again undertaken and it was noticed that a dove whose labyrinth had been removed, staggered, moved more and more unsteadily and more hastily until she finally fell.

Another peculiarity is the direction taken by the subject. The walk is not in a straight line but swerves from the healthy labyrinth. Since this swerving is constant at every step, the direction takes on the form of a circular path. It is the so-called Manege-movement which causes the pigeon to move with a hasty, awkward, fluttering walk in a circle. The head assumes a peculiar, downward position turned toward the affected side. These experiments prove that the semi-circular canals control the equilibrium of the body and the muscle functions of the body in motion. The semi-circular canals contain two elements of stimulation of the sensory nerve located there. The otoliths rest on the sensory hairs of the nerve endings in the utriculus and sacculus, and these, by their weight, stimulate the filaments of the vestibular nerve with every change in the position of the head; this stimulus is modified by these changed positions of the head. These two stimuli, known as the "maculae staticae," are arranged in two planes and seem to control our sensations of horizontal and vertical movements. The nerve-ends in the ampullae of the semi-circular canals assist us further in orientation. Here, too, we find sensory hairs as end-organs of the vestibular nerve. The maculae are controlled by the otoliths (Verworn terms them the statoliths) which stimulate the sensory hairs by their weight, while the sensory hairs of the ampullae are suspended freely in the labyrinth fluid and movement of this endolymph stimulates them. According to the theory of Mach-Breuer, we assume that changes in position of the head produce currents in the endolymph which, by its motion, stimulates the sensory hairs. The arrangement of the semi-circular canals in a

geometric system, symmetrically bilateral and identical, admits of numerous sensations in the many possible positions of the head. The three planes of direction of the semi-circular canals do not correspond to the planes of the head but are grouped at an angle to the head. Furthermore, this offers an unusually exact orientation as two fixed planes are established by the otolith apparatus and the encapsulated semi-circular canal system transmits in a reciprocal relationship its varied sensations of space orientation.

The sensory impressions transmitted by the vestibular nerve to the muscle apparatus of the general system are very unusual and are as yet not fully determined.

The entire musculature of the body receives stimuli from this source by reflex routes which induce its activity and influence the general position of the body. (Tonuslabyrinth).

The symmetric bilateral construction of the body also plays an important role here because the evenly opposed semi-circular canals of each side must, correspondingly, conduct stimuli to the two sides of the body which must produce a different muscular impression on one side than on the other. Thus the superior right and the inferior left semi-circular canals, lying in a common plane and because of their similarly directed planes, are stimulated alike by a certain turning motion and the impression must thus reach a different group of muscles on either side. In this way it is possible to develop varying influences on the functions of the body-musculature by varying vestibular stimuli. The semi-circular canal system regulates the movements of the body. This is most marked in the reaction of the muscles of the eye and numerous observations have been made in this field.

Correct, systematic functioning of the eyes must be considered in the changing attitudes of the body when we admit the influence of the eyes in orientation. Therefore, the semi-circular canal system must be most intimately associated anatomically with the occulomuscle system. Stimuli of the semi-circular canal system can produce characteristic ocular movement which in one apparatus must correspond to the function in the other. By slow and long-practiced movements, the one apparatus regulates the other by force of habit in that the stimuli of the semi-circular canal apparatus control the turning of the eyes. What is the result, however, when unaccustomed and augmented stimuli are produced to which the semi-circular canal apparatus and musculature through lack of habit cannot respond? We all know that form of vertigo due to rapid, active turning of the body as well as the passive form produced by

the turning-chair or merry-go-round, which may occur with eyes open or closed, but which manifests itself similarly whether the eyes be open or closed. In either instance the same ocular reflexes take place. Vertigo resulting from turning leads to nystagmus.

The unsteady eye moves back and forth in its search for a fixed point by which to establish the position of the body in space. In turning on the merry-go-round we look for a fixed point in the surroundings, which disappears as we continue to turn, while we attempt to follow it with our eyes which are being influenced by our movement. As we turn more rapidly, the eye, which has followed the impressions passing to the right, must, by means of jerky movements, attempt to fix the new impressions coming from the left. In this way the unconscious to-and-fro motion of the eyes is produced, which we term nystagmus and which we recognize as a symptom of vertigo. It has just been stated that this movement of the eye, after the body has rotated, may be noted whether the eyes have been open or closed and that after such movements with closed eyes we may distinctly observe the tremulous motion under the lids and the sensation of vertigo is experienced. Therefore the connection between the semi-circular canals and the muscle apparatus of the eye is so intimate that stimulation of the former produces reflexes in the latter without the need of optical impressions or stimulation.

This leads to the conclusion that the disorder produced by the unusual stimulation of the semi-circular canal apparatus also affects the eye muscles. But since, as we noted previously, the entire body musculature is regulated by the eyes, a general vertigo results, causing unsteady motions, as though the body were trying to find a footing. The futility of these movements leads to greater uncertainty in bodily statics and dynamics. That, through habit, we are able to suppress vertigo may readily be noted in observing the pleasure which children experience in a swing or merry-go-round. Another instance may be cited in the dervishes who indulge in the rotary motion to an extreme that causes the normal individual to shudder. These observations demonstrate my hypothesis.

It should be emphasized that vertigo does not exist as an independent impression because it is not produced by a single organ. We have seen that the consciousness of the harmonious sensation of equilibrium, which the normal individual takes for granted, results from a systematic co-operation of all the involved sense-perceptions. This fact explains the presence of vertigo resulting from abnormal stimulation of the special sense-organs.

TUMORS OF THE SEPTUM.

DR. RICHARD H. JOHNSTON, BALTIMORE.

The rarity of tumors of the septum prompts me to report the following four cases which were seen in the clinic of the Presbyterian Hospital:

Case 1: A woman, 57 years old, came to the clinic complaining of right nasal obstruction. Examination showed a good-sized tumor in the right nostril attached by a pedicle to the septum just opposite the anterior end of the middle turbinated body. It was hanging low in the nostril and was pressing against the turbinate, which accounted for the obstruction. There had been no hemorrhage. The growth was easily removed with scissors and the wound cauterized. Healing was uneventful. Microscopic examination of the tumor showed connective tissue and glands with few blood-vessels. The outer surface which was smooth, was covered with columnar epithelium. The diagnosis was fibro-adenoma.

Case 2: A man, 35 years old, had noticed a growth on the right septum which he was constantly picking. He finally began to have hemorrhages and then thought it time to consult a specialist. The tumor was situated on the right septum about half an inch from the skin; it measured one-fourth inch in diameter and was lobulated in appearance. From constant picking it had assumed a reddish-brown hue. It was removed from its broad base with scissors and the wound cauterized. Microscopic examination showed numerous papillae, each with a central process of connective tissue. The diagnosis was papilloma.

Case 3: A boy, 7 years old, had had severe hemorrhages from the left nostril for some time. Examination showed a large tumor on the left lower septum which bled at the slightest touch. The growth was removed with the snare and the wound cauterized. Microscopically it was a fibro-angioma, the so-called "bleeding polyp."

Case 4: A man, 42 years old, had a small, pedunculated tumor on the right septum high up. It had the appearance of a polyp. After removal it was examined by Dr. H. J. Maldeis, pathologist to the hospital, who, to our surprise, reported myxo-sarcoma. As the patient has not returned to the clinic, we infer that he has had no recurrence. The first three tumors were examined by Dr. L. J. Goldbach.

807 North Charles Street.

REPORT OF A CASE OF PHLEGMON STARTING AS A PERI-TONSILLAR ABSCESS AND EXTENDING DOWNWARD AS FAR AS THE SECOND RING OF THE TRACHEA.*

DR. GEO. L. RICHARDS, FALL RIVER, MASS.

The following case is an example of a severe case of pharyngeal phlegmon having its origin primarily in a peri-tonsillar abscess and secondarily in a diseased tonsil. The patient was a large, well-nourished man, 42 years of age, of English parentage. The family history was negative. The previous history was that he had suffered from occasional quinsy sore throat for the past three years, having had two or three attacks. Otherwise he had been well. The patient presented himself in my service at the Union Hospital on the afternoon of August 20, 1909, with a history of a sore throat of several days duration, followed by difficulty in breathing and swelling of the entire left side of the face and neck. The left tonsil had been lanced once the previous day, and again on the morning of admission, but without relief, and the abscess had been continually increasing in size. At the time he presented himself he was breathing with great difficulty, and with occasional paroxysms of dyspnea and coughing. The entire left side of the face and neck clear down to the collar-bone was swollen and edematous. On examination of the throat, which was made with some difficulty, the tonsil and lateral wall and the supra-tonsillar area were intensely swollen, and largely filled the available area in the throat. The patient was near-cyanotic, with a pulse of 124. The skin of the neck was very tense, but I did not feel any definite fluctuation.

I assumed that I had to do with a large peri-tonsillar abscess, and sent him at once to the operating room. He was seated in a chair, a knife got ready, the tongue depressed, and an incision made in the supra-tonsillar fossa. This brought pus, and also a paroxysm of coughing. As the first opening had been more in the nature of a diagnosis as to the seat of the pus, and was only a small one, the patient was quieted, and then an attempt made to enlarge the opening. With the first enlargement of the opening there was a gush of pus, at the same moment an inspiratory spasm, a quick cry, and cessation of breathing. He was immediately placed on an operating table, but by this time respiration had ceased. Unfortunately, noth-

*Read at the Thirty-fifth Annual Meeting of the American Laryngological Society, Washington, D. C., May 6, 1913.

ing was ready for a tracheotomy, and in the sudden shifting from the chair to the table the knife had been dropped on the floor, and momentarily lost. A hurry call for a knife brought me first a thin nasal chisel, which the interne in his hurry had mistaken for a knife, and a delay of several seconds occurred before a knife was obtained. The head was placed somewhat over the edge of the table, the neck on the stretch, and a quick incision made at the supposed site of the first and second rings. Much to my surprise, I entered not the trachea but an abscess cavity, and found that the abscess from above had burrowed downward producing a phlegmonous inflammation of the tissues of the neck, and had pushed the entire trachea and thyroid area well over toward the right, and itself extended down to a little below the second ring of the trachea.

The lower abscess being opened, and while still flowing pus, I was able with the finger to orient the trachea which was then quickly opened. The patient by this time was apparently lifeless, but the pulse was still beating. Artificial respiration brought inspiration after a few seconds, and in a short time breathing was re-established, and a tracheotomy tube inserted. The abscess cavity in the tonsil was then widely opened with the aid of the finger as well as the abscess cavity at the site of the trachea. The two were found to communicate. The patient was placed in bed with the feet about a foot higher than the head, and kept in this position for the next three or four days, a wick being inserted around the tracheotomy tube.

The after-history was uneventful, the temperature which was 101.5° on admission slowly going down. There was an abundant pus-discharge from the mouth and at the side of the tracheotomy tube for the first few days. The tracheotomy tube was removed on the eighth day, and he was discharged from the hospital cured on the seventeenth day, the neck at this time being nearly healed. The drainage tube was continued until complete closure of the skin wound. He was advised to have the tonsils removed, but never came back to have it done. I have recently looked up the case, and find that he has been perfectly well for the last three years.

This case illustrates the possibility of danger in a case of peritonsillar abscess, and the absolute necessity of the evacuation of such an abscess; also the danger in allowing such an abscess to go on to the point where it discharges itself. It is sometimes stated that such an abscess will eventually discharge itself just about as well as when assisted. This does not seem to me to be the case. While it is sometimes true that they will find exit from the peri-

tonsillar fossa at the junction of the anterior and superior pillars, it is never safe to wait for this. While cases such as I have described are probably relatively seldom, the possibility of the extension of a purulent process down the neck must be borne in mind. The course of the pus probably corresponds to the course of the bucco-pharyngeal fascia, which invests the constrictor muscles of the pharynx, and is given off from the prevertebral fascia, this latter fascia forming its posterior limit. The superior constrictor muscle, which is in close contact with the tonsil, is in relation externally with the prevertebral fascia. In this case the pus probably forced its way through the fibers of the superior constrictor muscle, thus gaining access to the prevertebral fascia. Thence it followed down the neck along the line of this fascia; thus coming in contact with the larynx and trachea, since this fascia forms the posterior limit of a fibrous compartment which contains the larynx, trachea, thyroid gland, pharynx and esophagus.

An error which I made here should also be avoided, namely, the attempt to open any such extensive phlegmonous collection of pus without being prepared for a tracheotomy. Again, so extensive an abscess should have been opened in the first place with the individual on the back. Pressure on the pneumo-gastric probably accounted for the severe dyspnea. As to exactly why the inspiration of the pus should have caused cessation of respiration rather than a paroxysm of coughing I am unable to state, unless relief of pressure on the pneumo-gastric produced for the moment some temporary paralysis or disturbance in function. I believe it is true that sometimes sudden cessation of pressure may produce some such effect on the respiratory centre.

124 Franklin Street.

Modern Treatment of Ozena. G. Mahu, *Presse Med.*, Jan. 4, 1913, p. 9.

Paraffin injections, methodical breathing exercises, and insufflation of lactic ferment are especially recommended. Mahu also mentions the various methods of nasal irrigation, the different syringes used for paraffin injections (Mahu, Gault, Leroux), and Foy's compressed-air instrument. Ed.

SIMPLIFIED TECHNIC FOR THE REMOVAL OF THE FAUCIAL TONSILS.

DR. L. F. LONG, ZANESVILLE, OHIO.

In all surgical operations the technic which is the most simple, requires the least number of instruments, the fewest assistants, and with which the work can be done quickly and well, is always desirable. In the removal of the faucial tonsil various methods are used with good results, some with quite an array of instruments, several assistants, etc. and the time consumed by various operators varies from a few minutes to an hour or two. With the technic I am using I have reduced somewhat the number of instruments and assistants, get good results and shorten my operating time.

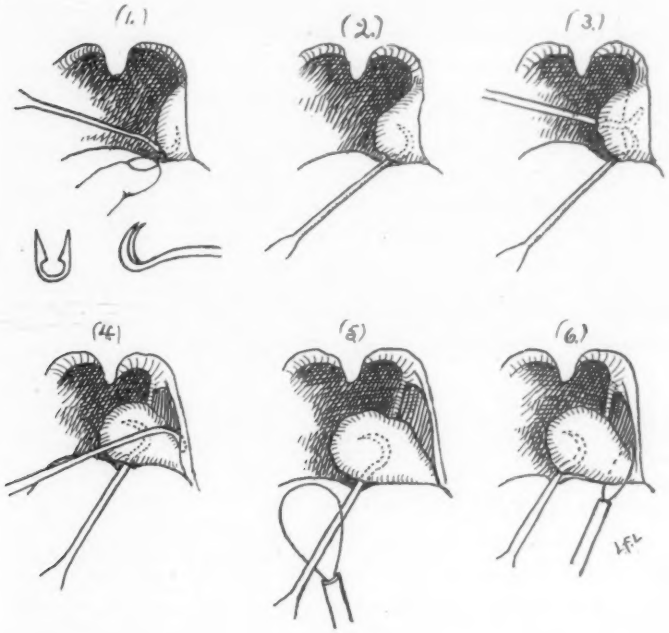
The instruments used are: (1) A self-retaining mouth-gag (Murdock's). (2) A tonsil hook, which I have devised, having two prongs, with a thickening on the inner surface of both prongs, which prevents the hook from easily slipping out after it is placed in the tonsil. The handle of this hook is of such size that the loop of the snare can be easily slipped on or off the tonsil without disengaging the hook after it is once placed. (3) A tonsil knife (Tydings). (4) A strong tonsil snare (Tydings). These four instruments are all I use. I have in readiness a tonsil hemostat but very rarely have occasion to use it.

For illuminating the field I prefer an electric head-lamp, rather than a head-mirror or a light held by an assistant. In localities where the city current is not available, an electric head-lamp with a small battery attached is on the market, which answers every purpose.

Technic:—In general anesthesia I place the patient on the right side, with head low and have a small instrument-table within easy reach and view, upon which I have the four instruments named and a number of gauze sponges. The operator is seated, or with a high table the operator stands. If using local anesthesia the mouth-gag is usually not required, and the patient is in the sitting position.

Under general anesthesia as soon as the patient is relaxed the mouth-gag is quickly slipped in place and opened sufficiently to

give room to see and work. The right, or lower tonsil is first removed. The index-finger of the left hand presses down the tongue and the hook is inserted from below upward, then by depressing the handle of the hook, the tonsil is lifted up and out and at the same time the handle of the hook acts as a tongue-depressor; this brings the tonsil in good view and the tonsil knife can be slipped between the posterior pillar and the tonsil-cutting upward around over the top and down between the anterior pillar and the tonsil.



This should liberate the tonsil so that it will roll out from its bed, if it does not, the knife should go over the same route until the tonsil is well liberated from the pillars and from the upper two-thirds of its bed. After it rolls out well the snare should be slipped over the handle of the hook without changing the hold of the hook, and the base of the tonsil snared off, the snare being drawn through the tonsil base rather slowly, as possibly this may reduce the amount of bleeding.

With this method the first tonsil can be removed before any, or, at most, very little sponging is required. Then by holding a sponge firmly against the bleeding-surface for a minute the second tonsil can be removed by the same technic. The whole process ought not take more than a few minutes.

The advantages of this method are: Simplicity, no assistant required except the anesthetizer. Good working space and view, no tongue-depressor or assistant's hand in the way. If properly done, it removes the tonsil within its capsule. The operating time required is short.

410 People's Saving Bank Building.

Ethyl-chlorid Narcosis in Operations on the Throat, Nose and Ear. ALFRED FALK, *Ztschr. f. Laryngol.*, Vol. 6, Heft 1, 1913, p. 1.

For such operations as the opening of a peritonsillar abscess, paracentesis, and removal of tonsils and adenoids that require only a short time, ethyl-chlorid, according to the writer, is the ideal anesthetic. It works best on a full stomach, two hours after a regular meal. The patient is sitting upright, children being held in this position by an assistant. As the narcosis may be accompanied by trismus, a dental wedge is put between the teeth. The narcosis mask is applied dry to the mouth after the patient has taken a few deep breaths, the ethyl-chlorid is sprayed all over the mask. When ice-formation takes place, the spray must be discontinued until all gas is inhaled. The signs of total anesthesia are muscular relaxation, ocular convergence and deep snoring respiration. In small children, where inspiratory stridor takes place at the onset of the narcosis and in hysterics that become excited after the first few inhalations of the gas, the mask should be removed for a few seconds and the narcosis continued when the respiration becomes regular. Up to the present time ethyl-chlorid narcosis has been resorted to in about half a million cases with only fourteen deaths due to the anesthetic.

GLOGAU.

CHRONIC STENOSIS OF LARYNX AND TRACHEA—REPORT OF CASE.*

DR. CHAS. A. LEAVY, ST. LOUIS.

The patient presented to-day, Miss H., contracted diphtheria January 5, 1895. Diphtheria antitoxin was not used in her case, for it was only being introduced into this country about that time. It was necessary to intubate her on the sixth day of the disease. The intubation tube was removed and replaced several times on account of the difficulty in breathing, and on March 12, 1895, a low tracheotomy was done.

When it became evident that the patient would be unable to dispense with the tracheotomy tube, a small curved silver cannula with an eyelet on either side was inserted with tape drawn through and tied to hold it in position. This apparatus was worn continuously until she was operated on January 10, 1911. Thus it will be noted that the patient wore the cannula about sixteen years, removing it occasionally, when necessary, for cleansing.

Previous to the attack of diphtheria, no serious illnesses occurred and fortunately none since.

Patient first consulted me on April 24, 1910. Numerous attempts were made to pass the very smallest laryngeal bougies through a tortuous canal to the left of the median line posteriorly, but without success.

As medication, thiosinamine (Merck) in half-grain doses three times daily was used for about two months with no apparent result. Two weeks prior to operation, patient was given tonics, and put to rest so that she would be in the best possible condition.

By laryngostomy is meant the laying open of the trachea and larynx, which must be kept open usually for a long period of time for treatment, the indications being chronic stenosis of larynx and trachea, where there is not too much deformity of the chondrial box. It was first performed by Ruggi in 1898. Later successfully by Doctors Jackson, Ballenger, Killian and others.

The operation on the case herewith reported, was as follows: The ordinary antiseptic precautions were observed. About one hour before beginning operation the patient was given 1-100 grain

*Paper and patient presented at the meeting of American Academy of Ophthalmology and Oto-Laryngology, Niagara Falls, August 22, 1912.

of scopalomin and ¼ grain of morphin sulphate hypodermatically.

Just before placing the patient on the operating table a few intralaryngeal applications of a 15 per cent solution of cocain hydrochlorate were made. Then about 20 minims of a one per cent solution of novocain and adrenalin were injected intradermatically in the median line, i. e. line of incision. The patient was then placed in the Trendelenburg position to prevent aspiration of blood into the lungs.

The incision was begun in the median line over the cricoid cartilage, dividing the tissues layer by layer, leaving a small bridge between the wound and the tracheotomy orifice.

After tying the bleeding vessels, a mattress-suture of catgut was placed on each side of the severed thyroid gland. The tracheotomy tube was removed and the opening of the trachea and larynx was completed with Jackson's turbinotome by inverting the turbinotome and placing the lower blade into the tracheal orifice, being careful to keep in the median line and to hold the lower blade firmly against the parts to be severed. The larynx was then laid open with one incision.

The moment the wound was laid open, two assistants quickly retracted each side of the wound to prevent the aspiration of blood into the lungs.

On inspection the stenosis was readily seen and consisted of an extensive mass of cicatrical tissue, just below the cords, extending down the posterior wall, over the body of the cricoid cartilage. The posterior wall was incised in the median line down to the cricoid cartilage, through the scar tissue, exercising care not to cut too deep above the cricoid cartilage, as the anterior esophageal wall is quite soft in this region and situated immediately posteriorly. The mucosa was then sutured to the skin on both sides.

A dilating drain tube was put in place beginning with number 22 French soft rubber catheter; the lower end being cut obliquely so it would rest on the tracheotomy tube below. The ends were made smooth by burning the cut edges over an alcohol lamp. A gauze plug was sutured in the upper end of the tube. This tube should extend above the cords and as high as the closure of the epiglottis will permit.

The proper length of the tube was established by passing the finger through the mouth and feeling the upper end of the tube. To retain this tube in place, a suture was run through the tube latterly, about one half inch above where the oblique end rested upon the tracheotomy tube, and the thread on each side tied to the tape

plate. Before inserting the dilating drain-tube, it should be well anointed with sterile vaseline, placing the upper end first.

Fearing that the lower oblique portion of the dilating drain-tube might not rest on the tracheotomy tube below, but escape to one side, Furner's method was used, i. e., after cutting a hole in the lower anterior portion of the dilating drain-tube, squaring lower end, the tracheotomy tube was passed down through the opening made. In case the drain-tube does not fit snugly, a silk suture may be passed through and tied to the tape plate of the tracheotomy tube to prevent it from escaping into the lungs.

Figure 1 shows tracheotomy orifice, in which silver canula was worn, during the sixteen years the patient was unable to breathe through larynx.

It is well to have two tracheotomy tubes with dilating drain-tube attachments ready, so that when one is removed the other can be replaced immediately. Before placing the dilating drain-tube, it is advisable to have patient cough in order to expel the secretions from the lungs.

The tubes were changed every twenty-four to forty-eight hours. At first the external dressings were changed every three to four hours. They were moistened with bichlorid of mercury, 1-10,000

at first, and later with normal saline solution, as the parts became slightly inflamed. These gauze dressings were laid across the neck with the cut edges inverted; the first layer may be anointed with sterile vaseline and tucked into and over the inserted tube. Upon this a small role of gauze is placed in the wound, which assists in keeping the edges apart. It became necessary to touch up some granulations on the edges of the wound with silver nitrate.

The writer agrees with Doctor Chevalier Jackson, who said that the hardest part of the after-treatment, to those who have had little or no experience, is the proper selection and manipulation of the dilating drain-tube.

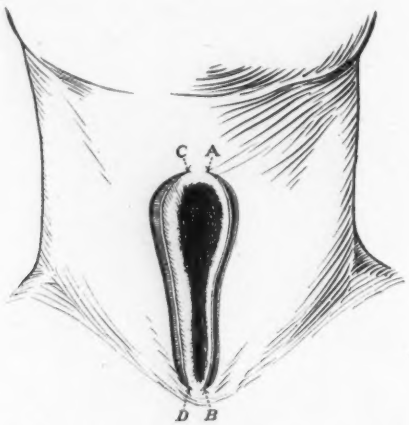


Figure 2 shows primary steps in plastic operation.

The only complication in this case was a sloughing of the cricoid cartilage on the twenty-sixth day after the operation, when a swelling of the tissues in the region of the cricoid cartilage was noticed. Dilation pressure was lessened. Three days later it was evident that a softening or sloughing of the cricoid cartilage was unavoidable. Two small openings were made, one on each side of the posterior wall, extending down to the lower edge of the body of the cricoid cartilage, for drainage purposes, and removal of small portions of cartilage as they became loosened. Covering a period of about six weeks, these cavities were cleansed, and in order to maintain and insure free drainage, a small wick of gauze alternating with rubber dam was inserted loosely into each opening, and dressings changed three times daily.

After the sloughing was over, the two small openings closed, and in a short time the posterior wall was perfectly smooth and no scar or trace of the openings could be seen. During the sloughing of the cricoid cartilage, the patient wore a smaller dilating tube than could have otherwise been worn; there was no rise of temperature; appetite good; slept well.

On April 15, i. e., four months and five days after the operation, instead of allowing the drain-tube to extend one half inch above the vocal cords, it was cut so that the upper end of the drain-tube rested one-half inch below the vocal cords. The lower end rested on the tracheotomy tube below, and was stayed to the tracheotomy tube by silk cord. The object of this was to spare the

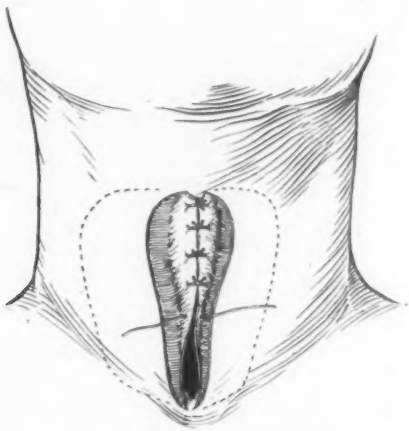


Figure 3 shows suturing in inner layer of plastic operation.

vocal cords all unnecessary pressure. This was more comfortable to patient, and in every way seemed more satisfactory. A good view of vocal cords could be had from below.

Three or four times during the seven months this method was used; a slight swelling and irritation was noticed where the upper end of the tube rested. Each time the use of the short tube was temporarily discontinued and a smaller and longer tube was used for a few days. After the tissues looked normal the short tube was again used.

Sargnon and Barlatier advise excision of the cicatricial obstructing tissues in cases of limited amount of tissue and instead of plac-

ing a dilating drain-tube, pack the cavity with sterile vaseline gauze.

The excision method is no doubt ideal in cases of limited amount of cicatrical tissue and especially in those cases where the same has not existed too long.

As weeks and months passed, in the treatment of this case, it was more evident that the open method used in this case was the very best and surest way of getting good results, as the cicatricial tissue was considerable in amount and was not confined to a small area. Even had the cicatricial tissue been limited in amount, in this case, the excision method would still have been impracticable as the chronicity of the case, i. e., the long period of non-use of the larynx and trachea had caused a general narrowing of the trachea

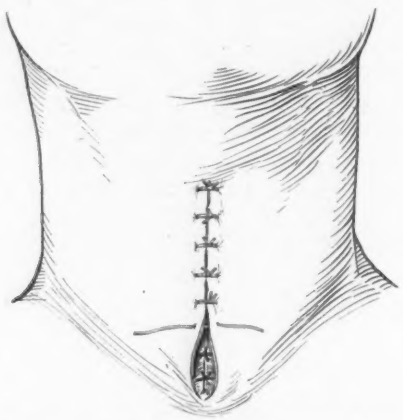


Figure 4 shows suturing of outer layer of plastic.

below the cicatricial tissue; and where the small silver cannula, through which the patient breathed for so long, rested, two folds, one on either side of the cannula, had formed and the instant the cannula was left out, the two folds would close.

As stated above, the selection of the proper increasing dilating drain-tube was the hardest part of the after-treatment. The size of dilating tube was gradually increased from 22 French soft rubber catheter to size 36 French soft rubber catheter.

Before closing the external wound by plastic, dilating drain-tube was left out and the pathological field carefully inspected for a period of four weeks. When dilating drain-tube was out, the wound was closed by wide strips of zinc oxid adhesive, which were placed

across the wound in such a manner as would best exclude the air.

This treatment was carried out for four weeks, replacing the dilating drain-tube twice during that time. The reason for replacing the dilating drain-tube was because of the accumulation of mucus, which would collect and dry in considerable amount in and about the wound. At the end of four weeks, no special change in the wound was observed.

Hence on November 2, 1911, nine months and twenty-two days after doing the primary operation, the external wound was closed

Figure 5; present appearance of exterior of healed plastic.

by plastic. First incision through the skin from A. to B. The inner edge of the skin was dissected back to mucous membrane. The outer edges of the skin was dissected back one half inch. Second incision through the skin from C. to D. Same dissection as on the left side with the exception that the dissection of the outer edge was carried back one inch. By inverting inner right hand flap and suturing same to inner flap on left side, and by drawing the two outer flaps together in the median line and suturing from top to bottom, a small opening was left below, in which was placed a small gauze wick for drainage.

The wound healed promptly and nicely with the exception of the small opening where the gauze wick was placed. This opening was closed by a small plastic, four weeks later.

At intervals of one to three weeks after doing the plastic, soft rubber bougies were passed up to the first of last June. It was not urgent at any time, but the patient experienced a slight difficulty in breathing, due mainly to the accumulation of mucus, which seemed to form occasionally. Since June 1, the patient has not received any treatment and fortunately has not experienced any trouble in breathing. She has a low, but fairly strong voice.

SUMMARY: Patient contracted diphtheria January 5, 1895. Intubated January 11, 1895. Low tracheotomy was performed March 12, 1895. Being unable to breathe through larynx and trachea, the patient wore silver cannula sixteen years. Primary operation January 10, 1911. Cricoid cartilage began to slough February 5, 1911. Six weeks later sloughing was over and trachea was looking fine and smooth. Patient discharged from Hospital April 11, 1911. Closed wound by plastic November 2, 1911. To date, (February 1, 1913), patient's health is perfect; breathing normal; has gained in weight; voice low, but strong.

Metropolitan Building.

Otorrhea of Twenty Years' Duration Cured by Surgical Interference Combined with the Use of Wright's Vaccine. J. LABOURE, *Revue hebd. de Laryngol.*, March 29, 1913.

This is the first time that the author has used the Wright's vaccine commonly used in England. There are two kinds: the mixed vaccine prepared from the staphylococcus, streptococcus and gonococcus, and the auto-vaccine made from cultures of the microbes found in the patient. The latter has a much greater specificity and gives a much more active effect. In the cases described, the auto-vaccine alone proved active, four injections being used.

SCHEPPEGRELL.

REMARKS AND RESULTS ON TWENTY CASES OF LARYNGEAL DIPHTHERIA REQUIRING TRACHEOTOMY.*

DR. C. E. PURCELL, PADUCAH, KY.

In looking over the medical literature there appears such an endless array of successful cases, that one is inclined to believe himself a victim of uncontrollable circumstances when he has cases that do not go in accord with such reports. I want to reverse this order of procedure if for no other reason than to emphasize the early, careful and persistent treatment of laryngeal diphtheria.

Before I started on this report I asked one of our leading and most careful surgeons what had been his results in tracheotomy for laryngeal stenosis from diphtheria, and he instantly remarked, "100 per cent fatality." I asked other surgeons, equally careful and successful, about these conditions, and their fatalities have also been the same in all the cases operated on. All of the men in Paducah who do throat work exclusively and with whom I have talked tell me the same story. All the cases I have heard of where tracheotomy has been done with the exception of one, in the class of cases I mention and by men who essay to do special work, have terminated fatally. The exception noted was a child tracheotomized by Dr. Warwick M. Cowgill, formerly of Paducah but now of Lincoln, Nebraska. I did not get the particulars in this instance nor did I write to Dr. Cowgill, but one of our physicians here mentioned the fact that he was with Dr. Cowgill in this case and that it recovered. He, as well as others, may have successfully tracheotomized patients for so-called "croup," but I have not heard of it. I made a special point to inquire the final outcome in every case I could hear of in this locality where tracheotomy had been done, in order to compare results with mine.

At one time I was so thoroughly disgusted with the final outcome of these cases, even though they all would have died without the operation and even though I saved one in five, that I refused to go when asked, but kept up with the termination of the cases when operated on by other men, which, as I have before said was always fatal. I saw a case with a brother practitioner and I opposed tracheotomy when the child should have been given the advantage of the operation.

*Read before the Southern Section of the Triological Society, New Orleans, February 16-17, 1912.

My own experience with tracheotomy as applied for the relief of profound dyspnea incident to laryngeal diphtheria has been twenty cases, and out of these I have four children living—a mortality of 80 per cent.

There are several questions that naturally suggest themselves, among which are: What was the cause of the high death-rate? Was death due in every case either in part or wholly, to the operation, or were there other contributing factors? If death was due to the operation, could not the technic be so revised as to overcome this fault? Why was it necessary to tracheotomize twenty children? Why not intubate? What bearing do the nursing and after-care have on the successful outcome of tracheotomies? And finally, what would have been the result in these twenty cases had tracheotomy not been done?

In the first place, I would have you bear in mind that these were the very worst cases we met, most of which were far removed from medical access, and the greater number might be classed as neglected cases. Seven or eight years ago diphtheritic antitoxin was not so universally used, and I found several practitioners who would not administer it under any circumstances. I believe that the operation *per se* was in no case the cause of death, because all were distressingly dyspneic and moribund, and there would have been twenty deaths instead of sixteen had the operation not been done.

In only two cases did the opening in the trachea fail to supply sufficient air. In these two instances, the diphtheritic membrane had formed low down in the trachea and not having at hand the extra long tubes, both children died without any benefit from tracheotomy. I should also add that in most cases intubation had been previously performed.

It is significant to note that those that recovered were the oldest ones operated on—6 to 9 years old. The reason I assign for the oldest ones recovering is that their treacheas were better educated to throw off the secretions and exfoliated membranes, and the physiological activities of the cough-reflex more fully developed. It is a well-known fact that very sick children, exhausted from long carbonic acid poisoning are unable to throw off the abundant and excessive secretions from the trachea and bronchi, and unless relief comes, they all die. As a child grows and develops equilibrium and co-ordination, learns to interpret positions (orientation), it also develops the cough-reflex and the power of forcibly throwing off the secretions by expiratory blasts. An infant cannot blow the secretions from the nasal passages, nor can it expectorate. I have seen, as all of you have, the trachea full of secretions and the child made no demonstrable effort of ridding itself of them.

An indispensable aid in operations on the trachea is a nurse specially trained and fitted for such work. It has been very annoying to me after doing a tracheotomy with an immediate improvement in the child's condition in every way, to hear after twenty-four or forty-eight hours that the parents who acted as nurses, let the tube stop up with dried secretions, with the consequent loss of the child. For obvious reasons, this operation cannot be done in hospitals where correct nursing can be instituted. In small towns and in the country, the operation has to be undertaken under the worst conditions so far as cleanliness, convenience and assistance are concerned. I have done more than one tracheotomy by the aid of a very poor, dirty and small coal-oil lamp held by some kind neighbor woman. I have arrived at the apparently completely asphyxiated child abandoned by family and friends as dead, and have instantly opened the trachea without any cleanliness or anesthetic, as the child was already anesthetized by carbonic acid poisoning, and have been rewarded by saving a human life. Those cases that recovered have had the best nursing and after-attention. I myself have stayed up more than a whole night seeing to it that secretions did not fill up the trachea and trachea tube, and instructing those who were to nurse the child how to free the air-passages of troublesome secretions.

It is not my purpose to tire you by an accumulation of routine histories. I have selected from my records a few cases that illustrate the features in their management that have been impressed upon me.

A girl, aged 4, was seen by me, twenty miles from Paducah, with a membranous formation in the larynx. Breathing was very difficult and labored; the temperature was very slightly elevated, and the heart's function was unimpaired. The child was intubated and full breathing was enjoyed for a few hours. Antitoxin was sent for but before it could be had and administered, slowly oncoming cyanosis made it imperative to tracheotomize. Just as soon as the trachea was opened, the oxidation of the blood was re-established and all other symptoms at once improved, apparently to normal. After an hour's sleep, the child was refreshed and made signs for some toys. Having some pressing appointments at home, I could not remain overnight to oversee the nursing. I instructed those in charge how to remove the tracheal secretions and what to do if impending suffocation should occur. I then left the patient with every symptom normal, after administering anti-toxin, and the outlook was unusually favorable. Several hours after tracheotomy the tube began to fill with the secretions, the parents and friends became panic stricken, forgot my instructions, and the child suffo-

cated. Here is a child that should have recovered with proper nursing and the removal of all excessive secretions.

The first tracheotomies were done under chloroform narcosis, and after a few hours when all conditions became rapidly worse, I could not help but feel that the anesthetic was a factor against the successful outcome of the operation, so that as more cases were seen, I finally adopted the practice of no general anesthetic and the non-use of sedations and hypnotics. The following case illustrates this point:

A boy, aged 6, was seen in January, 1904. He was so cyanotic and dyspneic that I pulled his head over the edge of the bed and opened the trachea without even washing the neck with soap and water. The family physician in charge was opposed to the use of anti-toxin, having seen some deaths from its administration, and therefore no diphtheritic serum had been used. There was an extensive membrane both in the pharynx and larynx and I insisted on the employment of anti-toxin. The physician in charge would not agree to give it and would not oppose my giving it, so I assumed responsibility and gave heroic doses frequently. The greatest trouble now was in keeping the tracheal tube free of secretions. I remained with the child over two nights, overseeing the nursing and instructing those in charge how to keep the trachea free of secretions, and the child recovered rapidly. You will note this child had no anesthetic, not even local.

If the patient is certain, or at least reasonably certain to require tracheotomy and is not too profoundly asphyxiated, it helps greatly to use a hypodermic injection of cocain and adrenalin at the point of incision. This is quite sufficient and the general anesthetic should not at all be permitted in these cases.

It has been, and is, my custom in these severe cases of laryngeal diphtheria to give large doses of anti-diphtheritic serum, frequently repeated. At the present, when there is such a widespread custom of giving immunizing doses of the serum to children exposed to diphtheria contagion, it might be well to pause long enough to see if this is the very best practice. Personally, I think it is not. Why? We know that we can produce artificially in animals the condition of anaphylaxis by the hypodermic introduction of certain substances. We also know this condition exists physiologically in man, when it would be very unsafe to administer a therapeutic dose of horse serum. That a prophylactic dose of serum might sensitize a patient and render a therapeutic dose dangerous or even fatal, has been proved by reports from all parts of the country. According to one investigator, 80 per cent of all serious accidents in the use

of serum occur in those who have previously been inoculated. I always ask, before giving serum, if the patient has ever been given a dose. Knowing that every child or person exposed to diphtheria will not contract it and having the utmost confidence in anti-diphtheritic serum, I prefer to wait till conditions develop sufficiently to warrant the use of anti-toxin. Many sore throats with simple ulcers and streptococcic membranes are diagnosed diphtheria and treated with anti-toxin, when, if we depended more on laboratory tests, the certainty of our diagnosis would be evident and more positive therapeutics employed.

The questions arising from the consideration of the foregoing facts might be summarized in answering as follows:

The death-rate of neglected laryngeal diphtheria—cases where massive doses of anti-toxin have not been frequently given—will under the best management continue to be appalling. If these cases are seen early and a prompt diagnosis made, with the consequent employment of suitable doses of anti-toxin for these cases, there should scarcely be any need of tracheotomy. The high death-rate in my cases was due to the profound toxemia induced by diphtheria and not to the tracheotomy. The proper technic to follow is to infiltrate the tissues with a very weak solution of cocain and adrenalin, no general anesthetic permitted, and separate the muscles as rapidly as possible down to the trachea, when it is caught with the tenaculum and an incision sufficient to admit the tube made into it. When it is impossible to know the extent and location of all diphtheritic membranes into the air-passages and when the larynx is swollen and practically closed by deposits, I have always urged that intubation should be undertaken only by the most expert, if even then it is permissible. No one can feel the air-hole and every one is liable to dislodge the membrane into this air-passage; thereby cutting off all air and rendering tracheotomy imperative, difficult and immediate.

It should be made plain to the parents that the best results can be expected only when the tracheotomized child is in charge of a day and night nurse, both being competent to take care of all excessive secretions.

In this series of cases, I am most certain nothing short of tracheotomy would have saved the four lives, and had the patients been older, I am equally sure there would have been more recoveries.

Since writing this, I did, on February 22, 1912, a tracheotomy where intubation had failed. The child was 20 months old and recovered.

208 Fraternity Building.

GOITER FROM THE STANDPOINT OF THE SPECIALIST.*

DR. MARTIN B. TINKER, ITHACA, N. Y.

All eye, ear, throat and nose specialists are interested in the general subject of goiter, I assume, much as I am interested in a general way in your management of the accessory sinus and eye conditions. Certain eye and throat manifestations accompanying goiter doubtless interest you and concern you much more than they do me. It is unlikely that I am capable of presenting these goiter questions as they most concern the specialist, but it will be my effort to present data specially concerning the relation of goiter to the eye and throat which I have collected from observation of several hundred cases during the past ten years, together with a few facts regarding the results of partial thyroidectomy and the many stage operation which I hope may have some interest for you. This will at least serve to introduce the subject for discussion, and I anticipate gaining far more information regarding the relation of goiter to the field of the specialist than I can possibly hope to bring to you.

Occurrence and importance of eye symptoms: In my experience eye-symptoms have been the latest to develop of any of the typical symptoms of exophthalmic goiter. In the average case circulatory symptoms are apt to appear earliest, nervous manifestations simultaneously or a little later, while the characteristic eye-symptoms appear only after the disease is well established. Bulging of the eye-ball and widening of the palpebral slit is usually the first symptom to attract the notice of the patient. Exophthalmos has occurred in 23 per cent of the cases which have come under my observation. Failure of the upper lid to follow the eye-ball in its downward movement occurs in 8 per cent of cases; sluggish reaction of the pupil to accommodation is noted in 14 per cent; lack of, or imperfect convergence is seen in 12 per cent; and frequent winking in 14 per cent. Any one or all of these symptoms may occur before there is very noticeable exophthalmos. The presence of any of the eye-symptoms is suggestive and helpful in cases in which the diagnosis is doubtful. In connection with these statistics, several questions must occur to every thoughtful man. What causes the exophthalmos? There are many theories but few facts, and no explanation that is entirely convincing. Why are one or two characteristic eye-symptoms associated in one case and other character-

*Read by invitation ,at the annual meeting of the American Academy of Ophthalmology and Oto-Laryngol., Niagara Falls, August 20, 1912.

istic symptoms lacking? Has this any significance or has it not? So far as I have been able to observe, the eye-symptoms are not associated with any degree of regularity. What is the significance of the eye-symptoms as regards the entire clinical picture? What, if anything, should we do about it?

The disfigurement of extreme exophthalmos is the symptom which distresses many patients, especially young women, more than any other symptoms. The deformity is especially noticeable when it is unilateral, as has been the case with five of my patients.

Severe pain was complained of in only a few cases. Moderate pain is of frequent occurrence, being mentioned in about ten per cent of cases. Conjunctivitis is of common occurrence, but fortunately it is not very acute in the majority of cases. Small corneal ulcers are by no means infrequent and obstinate, bad ulcers injurying the eye have occurred in three of my cases. Exophthalmos, which is not extreme and not of long standing, almost invariably disappears after thyroidectomy. Extreme exophthalmos, especially if it has been present for a long time, is one of the most obstinate of the classical symptoms of goiter. About fifty per cent of my patients in whom the deformity was great, have been permanently relieved of the deformity through thyroidectomy. Where there is about equal bilateral enlargement of the thyroid and only one side is removed, the eye on the side operated on occasionally returns to normal, while the eye on the opposite remains quite prominent. This has occurred in four of my cases. In such cases symptoms have also persisted which seem to demand further reduction in the size of the gland, after which the prominent eye has gone back to match that of the opposite side.

In the treatment of exophthalmos, three operative procedures deserve mention. Resection of the superior ganglion of the cervical sympathetic, osteoplastic resection of the outer wall of the orbit, and the simple operation of tarsorraphy. Resection of the sympathetic ganglion has been very highly recommended by Jennesco and Jaboulay, but it has not come into general favor with the surgeons who have had the largest experience in the treatment of exophthalmic goiter. It is possible that benefit sometimes results from this procedure, but even the cuts illustrating the patient's condition before and after operation in certain of Jennesco's articles are not convincing. The operation certainly offers no special difficulties to the surgeon familiar with the surgery of the neck, but the results thus far do not encourage its recommendation in the average case. Kocher states that it has been abandoned.

Resection of the outer wall of the orbit, as first recommended by Kroenlein, offers the only prospect of relief in case there is bulging caused by a tumor back of the eye-ball. The incision used by Kroenlein is disfiguring, the danger of paralysis of important filaments of the facial nerve is great, the exposure of the posterior part of the orbit is not as satisfactory as can easily be secured by other incisions, and splintering of the frail bones about the orbit is certain to follow the use of a chisel in forming the osteoplastic flap as was originally shown. The incision recommended by Kocher has many advantages over the original of Kroenlein. In a recent article I have given the results of rather careful study of the anatomy and technic of this operation. By placing the incision in the eye-brow and the line of the wrinkles radiating from the outer canthus of the eye it is possible to avoid an ugly scar and injury to the facial nerve. Division of the angular process of the superior maxillary and the frontal bones by the use of the Gigli saw avoids shattering the bones, and gives a much more satisfactory exposure. Those interested in this subject I would refer to *The Journal of the American Medical Association*, 1912, Vol. LIX, page 989.

The simple operation of tarsorraphy is all that is needed considerably to relieve deformity and to prevent serious injury of the eye from exposure in a number of the less extreme cases of exophthalmos.

Occasionally failure of vision and temporary blindness occur as the result of pressure of a large goiter, as was very strikingly seen in a case operated on by my former associate, Dr. Prince. Turning the head to one side caused complete blindness, which was relieved immediately when the head was turned back; it was probably caused by interference with the circulation. Occasionally temporary blindness not caused by pressure is noted, being mentioned by two of my patients.

Ear symptoms are relatively very infrequent in my experience. Three of my patients have complained of very severe neuralgic pain in the ear. This was probably caused by pressure on the branches of the cervical plexus or the nerve-trunks forming it. During the operation of thyroidectomy under local anesthesia, the patients frequently complain of severe pain in the ear, when the upper pole of the gland is being isolated, the vessels clamped and tied; also frequently when clamps are applied to the sterno-hyoid and sterno-thyroid muscles, as they usually are before division in order to expose the gland. It has occurred to me that this pain might come from tension on the stylo-hyoid muscles and the stylo-hyoid liga-

ment, which are in close relation to the Eustachian tube. Similar transitory pains in the ear have been noted by several of my patients. Partial deafness which has cleared up after operation was noted in one case.

Throat symptoms occur as the definite result of pressure in a very large majority of the cases that I have seen. A growth need not necessarily be very large to produce serious symptoms, provided it is located in the right place. The intra-thoracic and plunging goiters, compressing trachea and great vessels of the neck within the bony ring formed by the sternum and ribs in front and laterally, and the vertebrae behind, are most certain to cause trouble. In nearly one-third of my cases the growths have extended below the level of the clavicle, in many cases as far as it was possible to reach with the finger, and this considered, it seems remarkable that so few serious results of pressure occur. In a recent case a troublesome goiter the size of a large goose-egg was tethered just below the aperature of the thorax by elongated and tortuous superior thyroid vessels, and only appeared in the neck on swallowing. In another case a large growth was constricted and grooved deeply by the first rib, the surface protected by a well-developed bursa and the constriction, giving a somewhat dumb-bell shape. Both patients made satisfactory recoveries and have had entire relief. The origin of these forms of goiter is perhaps best explained by Kocher. A nodule developing in the inferior horn encounters less resistance to the surrounding parts when it grows downward behind the manubrium, may produce direct pressure on the trachea and marked dyspnea; more frequently it may grow behind the sterno-hyoid, sterno-thyroid and sterno-cleido-mastoid muscles, displacing the trachea backward and to the other side and extend in the opening of the thorax in the form of intra-thoracic goiter. The extension of such a tumor into the thorax is aided by two factors. In the first place, the thyroid gland moves downward during inspiration and is sucked into the thorax during deep inspiration; in the second place, the gland is forced into the thorax when the head is inclined forward. At first a deep goiter moves up and down with every inspiration, but when it extends underneath the first rib, having passed the narrowest portion of the thorax, it finds more room and the goiter continues to grow. A constriction is formed at the level of the upper opening of the thorax. When the goiter has reached this stage it no longer escapes from the thorax except during forced respiration, during deglutition and especially during cough, so-called *goitre plongeant*, diving or plunging goiter of the French. With the fluoro-

scope the tumor can be seen to rise during deglutition. A skiagraph shows a distinct shadow with a characteristic round border with convexity forward. An intra-thoracic goiter may attain enormous dimensions. It usually grows on one side, depending on the starting-point and rather more in front and to one side of the trachea, extending downward into the anterior mediastinum, where it is usually placed in front of, rarely behind, the innominate artery and arch of the aorta. The position is also determined by inspection and palpation.

With the diffuse forms, especially the soft, follicular and parenchymatous goiters, when the tumor is not large and the muscles of the neck are strongly developed, the patients are often unaware of the growth, and the functional symptoms, which chiefly attract attention, are referred to a great variety of causes and often treated accordingly. In cases in which it is difficult to feel the goiter, the examiner must never neglect to have the patient cough, as this renders the tumor much more distinctly visible and palpable. Diving and plunging (retro-sternal) goiter often can be seen or felt only when the patient coughs, and intra-thoracic tumors are often rendered much more distinctly palpable.

As Kocher states, dyspnea may be produced by pressure on the trachea; this is by far the most frequent form. It may be produced secondarily by pressure on the blood-vessels and consequent disturbance of the circulation; and by pressure on the recurrent nerve and paralysis of the laryngeal muscles, which is rare in ordinary goiter. It may be constant or paroxysmal and is increased by exertion; in the beginning it is present only during exertion but is increased with greater need of air. When the lumen of the trachea is greatly narrowed, especially when the pressure is circumscribed and unilateral, loud whistling inspiration and expiration result, the characteristic tracheal stridor. When the trachea is greatly constricted, certain positions of the head cause complete closure of the lumen of the trachea; sudden pressure from without or sudden exertion may produce attacks of asphyxia. This is particularly apt to occur when there is catarrh, which, owing to the diminution in the lumen of the trachea, is apt to become chronic.

In the examination of a goiter it is important to note the influence on the respiration of pressure applied to different portions of the tumor. In this way that portion of the goiter which exerts the greatest pressure can usually be recognized (Kocher). In the case of large goiters, which cause considerable displacement of the trachea, it is found that pressure on the sound side produces dyspnea

of greater intensity, or brings it on more quickly than pressure on the diseased side. Sometimes very slight pressure on the sound side suffices to produce complete occlusion of the trachea. In such cases, swallowing the wrong way, an attack of violent cough, or a hemorrhage into the goiter may be followed by sudden death from asphyxia.

Another condition of great gravity and of interest to the laryngologist is the so-called saber trachea. The lumen of the trachea is frequently narrowed by compression between two enlarged lateral lobes, with resultant difficulty in breathing. A number of my patients and some of their medical advisers have called the trouble asthma. Extreme and long-continued bilateral pressure may cause absorption of the cartilage of the tracheal rings and collapse of the trachea when the compressing growth is removed. In case of intrathoracic growths with collapse of the trachea after removal, tracheotomy is of little avail. I have seen one death from collapse of the trachea. The difficulty is much more easily prevented by early thyroidectomy than treated after such a serious complication arises.

Hoarseness and persistent cough are very obstinate symptoms in a few cases. As regards the frequency of the special throat-symptoms, cough has been noted in three-fourths of my cases; the voice has been more or less affected in two-thirds; there has been some difficulty in swallowing in about one-third of the cases, and more or less serious choking in one-fourth of the cases. One patient of mine had coughed almost constantly night and day for several weeks and was in an extremely serious condition. By free use of bromids and opiates, it was possible to relieve her somewhat and put her in shape for ligation and the stage operation, after which she made satisfactory recovery. In several such cases a diagnosis of tuberculosis of the lung has been made by the attending physician. In one case, tuberculosis actually co-existed with the goiter, and now after a year of over-feeding and rest in the open air, the tuberculosis seems quiescent and the patient is planning to come for an excision of her goiter within a short time. In cases up to date, the persistent cough has been entirely relieved by the operative treatment of the goiter.

As regards the relation of goiter to the voice in a considerable number of patients, especially those who have good-sized goiters, it has been shown that there is paralysis of one vocal cord from pressure of the growth before operation. These patients may speak fairly well except when they are over-tired or have some inflammation. They will tell you that they formerly used to sing, but are

now unable to do so; that after prolonged use of the voice they get hoarse or that when they have a bad cold they are hoarse or lose the voice entirely. This usually comes from pressure, but the decided general muscular weakness, from which almost all who have been long affected with exophthalmic goiter suffer, may effect the vocal cords and musculature of the larynx.

In simple goiter, injury to the recurrent nerve during operation, followed by permanent hoarseness is exceptional. Temporary hoarseness, on the other hand, is frequent, and as a rule comes from somewhat rough handling of trachea and larynx, unavoidable during operation.

Injuries of single fibers or branches of the recurrent laryngeal are rare also; the posterior crico-arytenoid muscle and inter-arytenoid muscle paralyses occur in isolated lesions of the posterior branch of the nerve, and are observed only in retro-tracheal goiter. Kocher states that paralysis produced by partial injury to the nerve causes a permanent hoarseness, while hoarseness due to unilateral total paralysis of the recurrent may disappear by the swinging over of the healthy vocal cord to the paralyzed side. Singing, however, is impossible in this condition. This restoration of the voice does not occur so long as the goiter, which is responsible for the paralysis, persists, but may occur after removal of the goiter, and also after a paralysis of the recurrent, caused by operation. Paralysis of the recurrent increases in already existing dyspnea, but in itself does not necessarily cause dyspnea unless posticus paralysis is produced. Whenever there are signs that the recurrent nerve is involved in a goiter, inflammation or malignant change should be suspected.

Injury to the recurrent nerve during operation is easily avoided in most cases by keeping away from the dangerous territory. The goiter is first isolated, except the deep part of the lower pole and the inner and posterior surfaces. The isthmus is then divided and the dissection carried down to the inner border of the trachea, the growth then hangs by a small portion of the capsule which is attached to the trachea along the inner and posterior surface. By dividing the capsule and separating the gland from the capsule of this small attached surface, injury to the nerve can be certainly avoided in the vast majority of cases. The nerve is in direct relation with the inner and posterior capsule; if this portion of the capsule is left intact the nerve will be uninjured, except in the case of deep-seated and intra-thoracic goiter, in which there is sometimes stretching of the nerve in bringing it up out of the cavity. In case of loss of voice after operation, it would be great comfort to the

surgeon to know about the existence of paralysis of one cord previous to operation, on the diagnosis of a competent specialist.

As is well known by all interested in the subject, there is, in the embryo, thyroid tissue extending from the neck to the base of the tongue. In certain lower animals it always persists as the thyroglossal duct, while in man it normally forms only a fibrous remnant. In fully one-fourth of my cases some remainder of the thyro-glossal duct can be seen in the neck. In a few, good-sized growths develop in it high in the neck. Enlargements of the lingual portion are exceptional, although an occasional growth has to be removed from the base of the tongue, and myxedema following removal of large lingual thyroid has been reported.

Medical and surgical results compared: A number of surgeons feel very strongly that surgical treatment should be advised for goiter patients much more frequently than is now the case. In order to come to any intelligent decision, we should have at hand definite facts with regard to the ultimate results of both medical and surgical treatment. Unfortunately, few internists have furnished facts regarding the ultimate outcome of patients who have been under their care. The only definite figures which have come to my notice are those reported by Kuttner, who was able to get information regarding the late results in twenty-one cases conservatively treated at the Breslau Clinics during eighteen years. Two died under medical treatment in the clinic; three who had been medically treated died later of heart failure. The total mortality in these conservatively medically treated patients followed for fifteen years proved to be 35.7 per cent, a figure as high as the worst results of surgical treatment in the hands of inexperienced operators. Of the survivors, not a single patient considered herself cured, and only one was able to follow her usual occupation; of the remainder a few were simply only improved, while a large portion were very much worse than when their treatment was first instituted. It would be very interesting and a highly important contribution if some of our own internists would follow up their cases and give us the ultimate outcome as has been done by Kuttner.

I have personal knowledge of eighteen medical deaths from goiter, a number nearly three times as great as my total fatalities during the past seven years, in which the great majority of my cases have been operated on. In recent years the results of surgeons who have had considerable experience has greatly improved, and the number of fatalities under medical treatment of which I have knowledge is greater than the total number of fatalities from the clinics of Koch-

er. Crile and myself during the past three years. At first sight this is a pretty bad showing for medical treatment of goiter, but it is quite possible that some of our progressive men could show much more encouraging results. We all await with much interest the reports of their ultimate results.

Permanent results: In order to get definite information about the ultimate results in operation for goiter, I have selected from my card-index of patients' addresses, 100 names of patients, most of whom live not far distant from Ithaca, and from all of whom I have been able to get very reliable information as to their present condition. There was no intentional selection of these names, except to take as large a proportion as possible of those who could be actually examined. Nearly one-half of my patients I have seen personally; most of them several times following the operation. Two of these patients died, one a few months after operation from apoplexy, another three years after operation from pneumonia. Both of these patients were in good condition as far as their recovery from the goiter operation was concerned. Of most of the patients who have not been examined by me or my assistants personally, I have received reports from physicians whom I know personally and whose opinion I consider reliable. In a few cases I have only succeeded in getting information by letter. With the exception of the two deaths mentioned, all are living from two to nine years after operation. None of these patients are worse than before the operation; all have been either greatly benefited or entirely cured. All of them are able to follow their usual occupations, and three have stated that they were in better health than at any previous time during their lives.

It is very certain that a very large number of goiter-patients first consult a specialist; sometimes the eye specialist for symptoms which the patient does not recognize as being in connection with the thyroid, more frequently, probably, the laryngologist for throat symptoms. In a large proportion of these cases the patient will need a partial thyroidectomy before recovery is effected. I believe that the operation is best performed in the vast majority of cases by the general surgeon experienced in the surgery of the neck. The preliminary examinations of many of these patients to determine whether the vocal cords are affected, the treatment of corneal ulcers and refractive errors should certainly come under the care of the specialist. Co-operation between the specialist and the general surgeon is certain to be of the greatest value to the patient.

The importance of early thyroidectomy can scarcely be exaggerated. By early operation, disfiguring exophthalmos with the at-

tendant risks of ulcer and perforation can surely be prevented, the growth can be much more safely removed, the contour of the neck will not be affected by displacement and pressure on the muscles, and of greatest importance, the risk of life will be reduced to a minimum. In uncomplicated cases the risk should not exceed that of the interval operation for appendicitis. It is true that a certain number of these patients exist as nervous wrecks for a good many years. It is equally certain that most of these patients could be made useful members of society and a considerable number of deaths avoided by early thyroidectomy.

105 North Aurora Street.

AN ENDOSCOPIC SYRINGE.

DR. CHEVALIER JACKSON, PITTSBURGH.

For the endoscopic injection of solutions of radium salts into malignant neoplasms, the syringe illustrated below has proved very satisfactory. It is made in a 30 cm. length for use through the

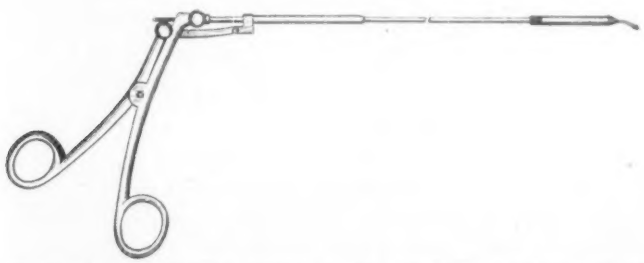


Figure 1. An endoscopic syringe for the injection of radium salts into malignant neoplasms in the larynx, trachea, bronchi, esophagus or stomach.

direct laryngoscope, 60 cm. for bronchoscopic and esophagoscopic use. The capacity is 25 milligrams, though it can be made for larger quantities of solution if desired.

Westinghouse Building.

AN IMPROVED AUDIOMETER.

DR. HAROLD HAYS, NEW YORK CITY.

Recognizing the difficulty which besets most otologists in the accurate testing of hearing in those cases where the watch and an ordinary tuning-fork are used, I have recently devised the instrument here described, which I hope will prove of a great deal of value.

The otologist, in his practice, depends upon the inaccurate method of watch-testing by moving the watch away from the patient's ear and guessing at the approximate distance. The variation from day to day may be as great as six to eight inches even when the most pains-taking care is used. It seemed to me that it would be advisable to devise an instrument whereby one could test so accurately that the hearing distance of the patient would vary less than half a centimeter. With this instrument such can be accomplished.

Again, our tests with the tuning-fork are grossly inaccurate. We use the tuning-fork by striking it against the knee or some other object. Whether the intensity of the vibration is great or small varies with the strength that is used in striking. Various mechanical hammers have been tried, but these also depend more or less upon the rapidity or intensity of the individual stroke. By mounting a tuning-fork on a standard base and having a certain definite mechanical hammer which cannot be changed this one difficulty can be overcome. This also, I believe, has been attained in this new audiometer.

The instrument can be described briefly as follows: It is well illustrated in the accompanying pictures. At right angles to a telescopic stand is mounted a scale, marked off in centimeters, about thirty-six centimeters in length. Along the upper part of this scale, on a ratchet, runs the recording instrument. By pressing the spring at the uppermost portion of the stand, the scale can be brought down parallel to it, so as to take up no unnecessary space (Figure 1).

The recording instrument which is mounted on the scale, contains two openings in a wooden cap, one for a stop-watch and the other for the tuning-fork. By moving the outer cog-wheel the instrument can be slid along the rachet and the hearing by the watch accurately measured.

For the watch-test the watch is inserted as in Figure 2, the watch first being placed against the patient's ear. An assistant holds the patient's head steady. The patient's eyes are closed and the watch is moved away from the ear silently until it can no longer be heard. The variation may be as great as five to six inches. The final point is reached when the variation is less than half a centimeter. This is recorded on the scale and marked down for future reference.

The watch is then removed and in the second opening a tuning-fork (preferably a 512 or 1024 fork) is inserted and the mechanical hammer which is telescopically arranged can be moved up or down

Figure 1. Dr. Harold Hays' improved audiometer.

so that one can place it in the proper position. The fork is then placed as near to the ear as possible and with the stop-watch in the physician's hand, the hammer is retracted by means of a spiral spring at its base by turning the second or inner cog-wheel to the right until it automatically springs against the tuning-fork. The watch is then pressed and allowed to run until the patient does not hear the fork and the time recorded in seconds. We then have two accurate measurements which can be graphically described in a fraction, the numerator being the watch distance in centimeters, the denominator the number of seconds the tuning-fork was heard.

For example, a patient hears the watch at 10 centimeters and hears the tuning-fork for 55 seconds. The hearing can be expressed thus: Hearing A. D.=10/55.

Of course, an instrument such as this is merely comparative, and its value lies chiefly in having an accurate test for individual hear-

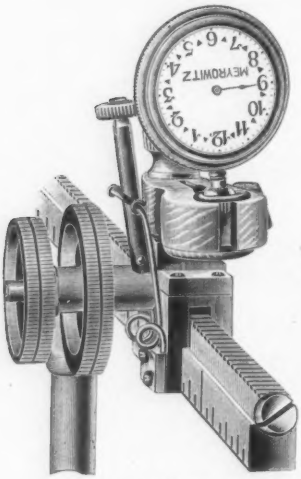


Figure 2. Audiometer with watch in place.

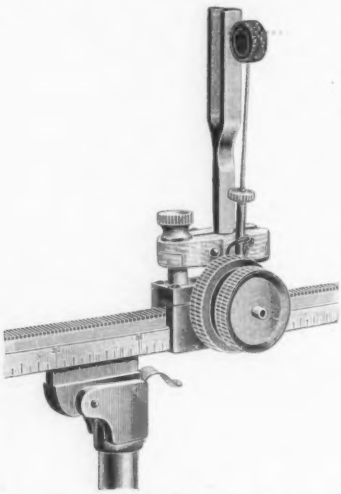


Figure 3. Audiometer with tuning-fork in place.

ing which can be measured day by day or week by week. No two instruments, no two tuning-forks, no two watches, will ever be alike, so that there is no value in comparing the hearing of an individual patient when a test is taken with two different instruments, and by two different men with different watches and tuning-forks.

11 West Eighty-first Street.

Emergency Tracheotomy. A. DENKER, *Med. Klinik*, Jan. 5, 1913.

Denker discusses the new procedure of inter-crico-thyrotomy as a substitute for crico-tracheotomy and describes the necessary instruments. According to the author's experience, the procedure is simple and safe and may prove of vital advantage in many operations. ED.

EDITORIAL DEPARTMENT

THE DEAF

Their Education—Improvement of Conditions—Responsibilities and Participation of the Profession.

JOHN DUTTON WRIGHT, M. A.
DIRECTOR OF THE WRIGHT ORAL SCHOOL FOR THE DEAF
NEW YORK CITY

The aim of this department of THE LARYNGOSCOPE will be to bring to the notice of its readers from month to month, facts that may be helpful to physician and patient in dealing with the life-problems involved in deafness. Suggestions from readers will be gladly received and all questions answered to the best of our ability.

The meeting of the German Scientific Society held in New York, in April, was given up entirely to the subject of the oral education of the deaf by the German or speech-method. The principal address of the evening was given in German by Dr. Otto Glogau, an otologist of New York City. Dr. Glogau reviewed briefly the history of deaf-mute education in the United States. The early introduction of silent methods and the later entrance of the speech-method. He emphasized the need of classification of deaf children according to degree of deafness, time of life when it occurred, and degree of mentality. He urged a more careful examination of all pupils by the Bezold continuous tone-system, and advised America to follow Germany in the establishment of special "hearing classes" in ordinary public schools, for such pupils as cannot understand whispered speech at a distance of one meter.

The deaf child of normal mentality should be instructed early at home by its mother. Between the age of three and six it should come to the kindergartens for the deaf. He said that the education of the deaf is a problem no more. Its solution was found by German teachers. Oral instruction by speech- and lip-reading will conquer the world for the deaf-mute, and that term will become a misnomer. But the public must be educated, and especially the mothers, as no mother can be sure that she may not have to bring

up a deaf child. But before all, the physician must wake up, and instead of assuring the unhappy parents that later the child will hear and speak, he should direct them to a teacher who can give it oral instruction by the speech-method, in order that precious time may not be lost, whatever the event may be. The specialist in otology should pay more attention to the fact that he is dealing with an otherwise normal child and not merely with a defective ear.

Special stress was put upon the desirability of paying greater attention in the institutions for the deaf to the residual hearing possessed by many of the pupils. The trouble is that the training and developing of residual hearing requires more individual attention than is possible under the present organization of the institutions.

I had the privilege of opening the discussion of Dr. Glogau's address. The points that we strove to have the audience grasp and carry away with them were that:

1. The little deaf child should begin its education by the speech method not later than five years of age.

2. The child that is made deaf by illness or accident should at once be placed under the care of a trained and experienced teacher of the speech-method. The necessity for prompt measures in such cases cannot be urged too strongly; without immediate and skillful attention the child who has learned to speak before becoming deaf will lose that speech. But if prompt and intelligent attention be given, the child's speech can be retained, lip-reading can be learned, and education can go on without interruption.

3. A very large number of pupils in our public schools are struggling along with defective hearing in the regular classes of forty or fifty with a single teacher. They should have special attention given them in small groups of fifteen or twenty. Examination of the more than half a million pupils in the public schools of New York City revealed the fact that one in each hundred has sufficiently defective hearing to be seriously handicapped in the regular work of the school. Yet these pupils are in no sense candidates for an institution for the deaf. They do not belong there and should not be sent there. Most of our public school buildings in this city contain about 2,000 pupils. There are among these 2,000, twenty pupils whose education should receive more special and personal attention than is possible when one teacher is responsible for forty or more pupils.

4. There is the very large number of adults who have grown more or less deaf after maturity. These people should be encouraged to form the habit of constantly watching the lips of those

addressing them, and taught to supplement their imperfect hearing by the use of their eyes in speech-reading.

But the most interesting and impressive part of the meeting was the demonstration supplied by three of my former pupils, Miss Helen Keller, Mrs. Kate Graham McGinnis and Mr. Horace R. Moorhead.

Miss Keller spoke in German for twenty minutes and then for fifteen minutes in English. Mrs. McGinnis and Mr. Moorhead carried on a conversation with me and replied to questions put to them by the audience.

Most of the 700 people present were equally familiar with both German and English, and later in the social part of the meeting many persons from all parts of the audience reported that they were able to understand Miss Keller, Mrs. McGinnis and Mr. Moorhead, whether German or English was spoken.

A physician sitting on the platform asked Mrs. McGinnis if she was interested in the suffrage question, and an amusing discussion sprang up between Mrs. McGinnis and Miss Keller. They proved to be on opposite sides of the question. Mr. Moorhead also made quick and witty replies to questions put to him by members of the audience, and won both laughter and applause.

The audience was deeply impressed and many members said the meeting was one of the most memorable since the founding of the Society in 1870. Such occasions cannot fail to do much for the cause of oral education in this country.

Vaccine Therapy of Whooping-Cough. A. BAMBERGER, *Am. Jour. Dis. of Children*, Jan., 1913, p. 33.

Bamberger used the vaccine (prepared from deep swabbings of the throats of children having pertussis) in six cases ranging from 1 to 4 years. He had no constitutional reactions. The treatment seems rather to lessen the severity of the disease and abort complications than to shorten markedly the duration. However, only two cases lasted as long as six weeks. ED.

SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

Regular Meeting, February 26, 1913.

JOHN F. McCOY, CHAIRMAN.

DISCUSSION OF DR. MILLER'S PAPER.

(*Continued from page 795*).

DR. MCCOY said that Dr. Miller had very kindly included him among the laryngologists whose opinion was asked. He felt that his work was principally to correct pathological conditions of the nose and throat affecting the larynx. He recalled the fact that a number of singers who had consulted him had very marked deviations of the septum, and after the conditions were relieved they said that a blanket seemed to have been removed from the resonance of the voice and that they could sing more clearly. On the other hand, he cited the case of a concert singer who had a very good voice with a very marked deviation of the septum. He had tried to convince this patient that his voice might be improved if the condition were corrected, but he claimed that he was doing so well as it was that he preferred to let well enough alone. There would seem to be some compensation by nature in the singing mechanism as well as other parts of the body.

DR. QUINLAN said that he had come to the meeting to listen with no idea of participating, but had been much entertained and instructed by the splendid cast presented to the section. Dr. Miller possessed peculiar facilities for this line of work, being both a musician and a laryngologist; he had been able to bring out some points that would be impossible for the ordinary observer. His education as a singer had been supplemented by his medical art, and that had enabled him to make the splendid demonstration that he had presented. It was a rare privilege to hear Miss Keller, and many persons with perfect vocal organs do not speak nor sing as beautifully as the young lady who has entertained us with her song and speech.

In his experience he has seen many singers with many defects of the upper air tract who had, notwithstanding, been able to sing in a most harmonious manner. Nature gives inherent forces which enable them to overcome many of these defects, whether enlarged tonsils, deviated septa, etc. In spite of these defects, nature compensates, and with mental and moral forces, enables such persons to overcome apparent obstacles, rendering possible such splendid results as have been shown to-night. One singer to whom he had made reference had a luxation of the arytenoids, yet this man had a sonorous voice which would echo and reverberate through the largest halls in the country.

Miss Keller was a most remarkable exemplification of what could be accomplished by one without sight or hearing, but with courage and patience and proper teaching, this last factor playing the great essential on the road of success.

DR. HARRIS TAYLOR: It is very fitting that we should have had both Dr. Scripture and Dr. White to discuss this matter of pitch. You notice that what Dr. Scripture complained of, the defect of the voice of the deaf, was what Dr. White found to criticise in Miss Keller, the lack of control of pitch and flexibility of voice. I think I am in a position to pass an opinion in regard to some phases of the work that has been done with Miss Keller. I remember her voice very distinctly, though until a few months ago I had not heard it for a number of years, and I think I should be able to notice changes in her voice which those who have been constantly with her may not have noticed, and the improvements that have been mentioned I think have actually been made. Some of you who are not acquainted with the deaf might infer that nothing had been done for Miss Keller until our friend from Boston took her in hand; but those who have had much to do with the teaching of the deaf would think that a great deal had been done for Miss Keller before he took her in hand. That is no discredit to him. We can still give him a great deal of credit for what he has accomplished, and still ascribe much honor to the woman who so well taught her under circumstances and disadvantages which you can hardly comprehend, unless you have been thrown with those who have always been deaf or who never learned to speak before they became deaf.

The instrument or apparatus shown by Dr. Scripture has been used with some of the pupils of the school with which I am connected. This and other forms of apparatus have proved effective in showing the children what their pitch was, and through these instruments they have been able to make corrections. There is no question but that the continuous use of these methods will enable us to go a long way toward establishing that which is of the very greatest importance in teaching speech to the deaf, a muscular memory of the vocal organs; therein lies the greatest success. We speak without any knowledge of what we do when we make a sound; if the deaf are ever able to be taught to speak well, they must be made to remember what they do when they produce a certain sound, and to the extent that a muscular memory is acquired to that extent their speech will develop, and when that is developed their speech is practically perfect.

What Dr. Scripture says can be done, and they can be taught to use the singing tone. If they can be taught to go from the dead, level, monotonous, foggy tone to one that has the enlivening features of pitch and difference in the length of the vowels it would add not only to the intelligence, but to the pleasure of hearing. Dr. Scripture has shown that it is practical and effective, and I feel that much may come from the line of experiments that he is now making with the deaf in our city.

THE CHAIRMAN said that at the request of several of the members, Miss Keller had kindly consented to say a few words.

MISS HELEN KELLER: I have not much to say. I am not prepared to talk to scientific men. I am on my way to Washington to take part in the Woman Suffrage demonstration. But I cannot resist the temptation to give you a little advice. This is too good an opportunity to lose. I may never have such a chance again.

When the physician fails to save the organ of hearing, he should do everything he can to save the child from the disaster of deafness. You and I know that lack of speech is the greatest loss caused by deafness. It is an immense burden added to the many great burdens which the deaf child must carry through life. Every aural surgeon should cooperate with the school-teacher in his efforts to pour the waters of speech into the desert of dumbness. Every aural surgeon should tell the parents and friends of the deaf child that he can learn to speak, that the sooner he learns the better will be his chance to speak well. There is another thing that surgeons and specialists can do. They can insist that all teachers of the deaf shall be qualified to teach speech. Many persons who are engaged in teaching little children to speak do not seem to know a larynx from a hole in the wall! Dr. Simpson says, it is important that teachers of singing should know something about the organs of speech. Surely, it is very important that teachers of the deaf should know a great deal about them.

The only way to help the deaf child at all is to help him immediately and in the right way. I understand that doctors often recommend useless remedies because they shrink from the painful duty of telling parents and friends that the condition of their patient is hopeless. Such kindness is expensive. It would be much better to help the patient and his friends, to prepare him for the new conditions under which he must henceforth live.

I was 6 years old before any physician was brave enough to tell my sorrowing parents my true condition. It was a Dr. Chisholm, of Baltimore, who told them that I should never see nor hear. But he said I could be taught, and he advised them to consult Dr. Alexander Graham Bell, as to the best method of having me educated. So from that intelligent doctor's office I passed from darkness and isolation to light, joy and love.

Dr. Seymour Oppenheimer said that all recognize the accessory nasal cavities of the head as resonating chambers, and that in the present enthusiasm for operating intra-nasally or otherwise for accessory sinus disease, we frequently have occasion to make large openings into the accessory nasal cavities. Dr. Miller had doubtless seen many individuals who had been subjected to these operations, and he would like very much to have him state what influence he has observed such operations have had on the singing voice.

Dr. Miller: I thank you for the kindness and attention which you have given this subject. In three conventions before which I have appeared, although in one instance I presented twenty-three patients, they were absolutely passed by without attention. I placed them there for advice, I wanted to know myself, and I concluded that it was that I had said too much in the papers that I had read and that I had not made statements which I could verify. To-night, I am overwhelmed with gratitude at what has been spoken and sung, and by those present that have spoken in behalf of this subject, for my heart is thoroughly interwoven with this subject, "Vocal art science."

In regard to the subject which Dr. Oppenheimer mentioned, I was just about to place a paper on the desk of Dr. Carter, asking Dr. Oppen-

heimer at what age he thought the sinuses were developed for phonetic importance. Children begin to speak at 2, we say. At 4 they do better, perhaps sing. At 7, they really have some fundamental voice. At about that age the accessory sinuses have some important function and phonetic value. If we take Dr. Tuft's law of the passage of vibration through substance, for instance, the well-known experiment of the bell within the sealed zinc cube, which is thrown into the air, the bell moves, but we hear no sound. Puncturing it with a needle or with a small piece of steel and straightway, if you throw it in the air, you will hear it. That proves that sound is transmitted by porosity and elasticity. Our accessory cavities are connected by the sinuses. Through the sinus must pass the vibration. Therefore, in the accessory sinus must be another phonetic value. In regard to this one subject, I will say that I have now three singers who have had both middle turbinated bones removed for good cause, for painful conditions in the surrounding sinuses, and those who have had their middle turbinated bones removed, have had a G, thoroughly well developed, much more so than before. The B-flat above that has also been wonderfully developed both as a fundamental and overtone. We would say that their middle turbinated bone, being removed, gave another quality of tone to the detonation that impinged upon the superior turbinated bone, and the space occupied by a diseased turbinated bone had been cleaned and freed by the removal of the diseased middle turbinated bone, when it was hypertrophied and thickened by means of the secretions that came down from the accessory sinuses. It would then have been an interference with the vocal mechanism, now it improves and furnishes extra powers to the resonator above. That is the way that I have been compelled to look at it.

Another thing sometimes occurs, that where the middle turbinated bone is removed for just cause on one side we will notice that the palate and front of the mechanisms concerned in the regulation of the various cavities concerned in phonation take on different arrangements and positions of adjustments to satisfy the laws of new resonance demanded by the removal or inflammation causing changes of space. This change is automatic to a great degree. As to what Professor Simpson asked, with reference to automatic action when the accessory sinuses were distorted, I will say, that you will find by observing the side of the vocal mechanism diseased or injured, commencing with the side of the nose, that it will first be relaxed by shock, then contracted to make up for the lost function in the making of resonance; the palate and tongue will be likewise affected and the side of the throat will seem at first to be in a state of paralysis and then in a state of contraction. Mr. Lorenzen is a remarkable example of that,—the whole side of his palate. Even now there is a retraction there, and I have seen the same thing in several other singers.

Our node question has not been spoken of to-night. There is a sample of that, too, I believe, many times. We find that the tonsil has a deposit, for in every case of the node that I have seen there has been a deposit in tonsils—not that they have caused it, but I have noticed it and I believe that by causing inflammatory extensions and muscular disability, relaxation of the side of the larynx occurs at first. There the

chord bulges and by attrition forms a node and sometimes the double node. In that way, even the turbinates and the tonsils may have a relating influence upon the vocal mechanism.

In conclusion, I want to say that in like manner the secretion from the sphenoid, for instance, which passes down on the posterior wall of the pharynx, create a difficult action in the palate and in the other muscles lying below and they, of course, will modify our tone. It will change the articulation, also the overtone quality in our registering resonator; they are all wet resonators, and any altered condition of that resonator changes voice values. All these change the character, the quickness of the movement of that resonator, also the fundamental tone which, made by the chord itself, will have to make corresponding accommodations and change phonetic results.

New Apparatus. DR. E. W. SCRIPTURE.

DR. SCRIPTURE demonstrated an apparatus by which persons totally deaf can be taught to sing three or four notes within an octave.

The apparatus consisted of two flame boxes, one of which is connected to an organ. When a note is played on the organ, the flame vibrates. When observed in a revolving mirror the vibrations become visible. A low tone produces a coarse vibration, a high tone a fine vibration. The patient sings into the flame box, and his vibrations are likewise observed in a revolving mirror. He learns to match his flames to those from the organ, and in this way to sing notes of different pitch.

In learning to sing he is taught to run his voice up and down within words as he speaks. He thus acquires a melodious manner of speaking. His voice is thus made very different from the usual monotonous and misplaced voices of the totally deaf. By this means one of the great defects of the modern system of lip-reading is removed.

DISCUSSION.

MR. CHARLES A. WHITE: This instrument which Dr. Scripture has exhibited is valuable in teaching tone and pitch to the deaf. I have found two conditions of voice in the deaf, the same with singing pupils, only in a lesser degree, one of over-tensed muscles; the other, over-relaxed. These conditions would have to be adjusted to match the flame and would incidentally bring vocal adjustment and control of pitch in reproducing the given tone, while at the same time the practice would help to develop voice.

Pernicious Anemia With Changes in the Mucosa. MATTHES, *Med. Klinik*, No. 9, 1913.

In these three cases of pernicious anemia the form of glottitis described by Hunter was present. The affected areas of the tongue looked like blisters and were sensitive to pressure; histological examination revealed a thinned epithelium with small-celled infiltrations. ED.

PHILADELPHIA LARYNGOLOGICAL SOCIETY.

Regular Meeting, December 17, 1912.

DR. ROSS HALL SKELLERN, CHAIRMAN.

Permanent Diplopia Following Killian Operation on the Frontal Sinus.

DR. ROSS HALL SKILLERN.

Demonstration of three patients:

Case 1: I. K. M., operated on April, 1911. Diplopia appeared three weeks after operation due to interference with action of the trochlea. Diplopia gradually disappearing.

Case 2: B. S., operated on June, 1912. Diplopia immediately after operation. Both unilateral and bilateral. Unilateral condition cleared up in a few weeks. Bilateral diplopia persisting. Under adjusting glasses the condition is gradually improving.

Case 3: M. D., operated July, 1912. Diplopia appeared six weeks after operation due to interference with the action of the superior oblique. The wound immediately above and below the bridge of the internal angle of the wound became infected during convalescence and suppurated. Healing occurred by second intention. Considerable deformity exists owing to the contraction of the scar tissue in this locality. The diplopia in this case is undoubtedly due to the muscle being caught and bound down in the cicatrix.

DISCUSSION.

DR. J. NORMAN RISLEY, (Ophthalmological aspects): I have thought it surprising that a permanent diplopia was not more often the result as one of the sequellae of the radical operation of the accessory sinuses as advocated by Dr. Killian, since in order to secure the desired result it necessitates such extensive destructions of the anatomical relations of the trochlea and pulley of the tendon of the superior oblique muscle. That this complication does not more often occur I think is due to establishment of a compensatory action of the other extrinsic ocular muscle or that a reattachment of the pulley near its original site is secured by cicatricial contraction of the newly formed connective tissue. I have had the opportunity of observing only one of the cases reported by Dr. Skillern, which proved of exceptional interest, since there was not only the organic diplopia secondary to the operation, but in addition a vertical monocular diplopia of the left eye, which after careful study could be ascribed only to a functional derangement, as none of the acknowledged pathological conditions producing this phenomenon were discoverable There were no pathological changes to be seen in either eye, and only a low degree of simple hypermetrophic astigmatism present. In spite of this the visual acuity was reduced to 5/IX in each eye, but rose to normal with suitable glasses, though with frequent relapses. The amount of the organic diplopia varied from day to day from 2½ degrees to 18 of left hyperphoria, as demonstrated by the aid of the maddox rod and

point of light at six meters, while the cover test was constant, all movement being corrected by a 11° prism base down over the left eye. The relation of the double images was always typical of a palsy of the superior oblique muscle. The visual fields showed the interlacing for colors, so often seen in hysteria. The diplopia was noticed first by the patient immediately upon the removal of the bandage forty-eight hours after the operations and has persisted constantly since that time. The monocular diplopia was manifest to the patient only when the right eye was closed, though demonstrable with both eyes open with the aid of a ruby glass or maddox rod placed before the left eye and a point of light at six meters. With the maddox rod she saw two horizontal lines of light below the point of light. I saw the patient first in August, 1912, about one month following the operation, when she came seeking relief for the double vision which incapacitated her for work at the loom. She gave a history of continuous headache for the past six years until relieved by Dr. Skillern's operation and presented the typical picture so often seen in that class of women who have passed their years of early development in the bad hygienic surroundings of a large textile mill with long hours of constant labor and insufficient nourishment. She had been referred to Dr. Skillern by a friend upon whom he had operated for the same condition some time previously and who also had a persistent diplopia. It is not surprising, therefore, that this girl in her poorly nourished condition and with her nervous system at the high tension it must have been with a continuous pain for six years, should be in that mental state where a suggested symptom would take deep root. After careful correction of her refractive error under prolonged mydriasis, two months treatment under general tonics, rest and regulated diet, the monocular diplopia disappeared, there was a gain in weight and as stated by the patient a diminution in the degree of the organic diplopia, although at her last visit on November 29, examination showed the same amount.

DR. H. MAXWELL LANGDON: (Ophthalmological Aspect): I have been especially interested in studying the involvement of the ocular muscles in these three cases since they are the first I have had an opportunity to examine, and I sincerely appreciate Dr. Skillern's kindness in letting me see them.

The first case, S. McS. shows a diplopia significant of a paresis of the left superior oblique muscle, but not absolutely typical, probably because the nineteen months which have elapsed since the operation have allowed the inferior rectus to cover up some of the deficiency. The image of the left eye is below that of the right, about fourteen degrees, the diplopia is homonymous, and the images are slightly more separated on looking down and to the right than they are in other parts of the field of fixation, without doubt a superior oblique involvement.

The second case, B. S., also a left-sided operation, has a typical superior oblique diplopia, the image of the left eye being always below, the separation increasing greatly in the lower field, especially on looking down, and to the right. Before I saw her, as Dr. Risley has already said, she also claimed a monocular diplopia of the left eye, which was present on her first examination after the operation; she had complained of diplopia on coming out of the ether. I think this monocular diplopia must have

been entirely functional; it has disappeared as mysteriously as it came, the usual organic changes which may be responsible for a monocular diplopia are absent, there is no dislocation of the lens, no partial absorbtion of the cortex, which might have allowed the muscles to tilt, and spasm of the ciliary muscle was ruled out by the atropin instilled for refraction. The patient had been told that she might see double and I think she was making sure that there was no lack of diplopia by not only seeing double with both eyes, but by seeing double with the eye of the operated side.

The third case, M. R., has a very unexpected diplopia, which has come on only a long time after the operation. When I heard the history I supposed that the contraction of the unusual amount of scar-tissue present had caught the trochlea and was interfering with the action of the superior oblique but to my surprise the superior oblique is quite active and the diplopia is a crossed one, with the images level and apparent only in the extreme left portion of the field of fixation, and as much above as below, typical of a deficiency of the left external rectus, but undoubtedly due to a contraction of the tissue around the inner canthus caught in the scar and presenting a complete relaxation of the internal rectus or the parts immediately around it. This condition is the result of an unusual complication of the operation and need not be further considered.

Undoubtedly the muscle most likely to be affected in the radical operation on the frontal sinus is the superior oblique, since a necessary step in the performance of the operation is the separation of the periosteum including the trochlea from the inner wall of the orbit. That this important structure in preserving ocular equilibrium is always accurately replaced seems to me to be doubtful; that it is usually approximately returned to its former position seems likely in view of the few cases having a permanent diplopia after the operation. I believe, however, that many cases will show for a few days, or a few weeks after the operation, a deficiency of superior oblique action if properly searched for in the lower portion of the field of fixation, and with the images of the two eyes so differentiated as to render fusion unlikely, for it must be remembered that if the images are similar and not greatly separated the fusion sense will in many cases cover up the deficiency. Dr. Skillern has promised to let me see his cases before and after operation and a search for such conditions will be made.

Dr. Geo. M. Coates: These frontal sinus radical operations are always of interest, not only on account of the improved results that sometimes occur, but also for the excellent results frequently obtained, which are well illustrated in the three cases presented to-night by Dr. Skillern. In two of them the cosmetic result is perfect, and in the third, we must remember that the presence of a very large sinus must necessarily leave a depression, as is shown here. Why we do not have more permanent diplopia has always been somewhat of a mystery to me when we consider that the attachment of the superior oblique muscle of the eye is destroyed, and even when it is replaced in about exactly its original position, I should think that there would be some slight change in the muscular action, sufficient to cause diplopia. However, it is of comparatively rare occurrence, the only case I have had personally being one in which the eye-ball was in bad condition due to an orbital abscess previous to operation. This diplopia has persisted to a certain degree.

Demonstration of the New Kahler Bronchoscope With Indications for its Uses. DR. CHARLES A. O'REILLY

DIRECT LARYNGOSCOPY.

Anesthesia by means of the Marschik laryngeal syringe. The end is wound with a pledget of cotton, and the barrel filled with a solution of cocain twenty per cent and adrenalin, in the proportion of 10 to one. With the laryngeal mirror the application is made to the laryngeal surface of the epiglottis and the vocal cords.

There are three applications made, and there should be an interval of from two or three minutes permitted between each application. Caution the patient that after the first application there will be a sensation of smothering or choking, which, however, will shortly pass away. In direct tracheo-bronchoscopy, after the operator has passed the vocal cords, there should be introduced through the tube of the bronchoscope a spraying tube, and the larynx and the lower trachea anesthestized with ten per cent solution of cocain and adrenalin. In children under 10 years of age or in a very nervous anemic or emiated person general anesthesia should be used.

Examinations. There are two varieties of spatulas for use in the adult. They are 15 cm. in length, one 14 mm. wide, the other 11 mm. For the typical examination, the spatula of 11 mm. is the preferable one. The spatula is in the shape of a tube for one-third of its upper portion. The middle third of the tube is open like a channel, but the edges of it are sufficiently raised to prevent the tube when pressed against the tongue from obscuring the field of vision. The lower third is much flattened and has a sloping end. The spatula affords a field of vision twice as great as the closed tubes without causing the patient any great inconvenience.

After the patient has removed his collar and any obstructing articles of clothing or false teeth, he should be placed on a stool 20 to 30 cm. in height. An assistant should stand behind and support the patient's head, and upper part of the body in the requisite position. The spatula should should be fitted to the electroscope, and the mirror should be warmed over an alcohol lamp, the spatula being anointed with pure sterilized glycerin. The process may be divided into three steps: 1. Bringing into view the lingual surface of the epiglottis. 2. Passing beyond the epiglottis and pushing it aside. 3. Pushing the tube deeper, possibly through the vocal cords into the larynx.

1. The patient should bend his head back very little, the surgeon introducing the spatula exactly in the median line, not too vertically, so that when the tongue is depressed the upper edge of the epiglottis comes into view. It is most important through all of these steps that the examining surgeon's eye should remain at all times over the slit in the electroscopic mirror. After the free edge of the epiglottis has been brought into view the end of the spatula should be slightly raised and passed over the epiglottis to the median line.

2. The patient's head should now be held back a good deal more. At the same time while keeping in the middle line, the surgeon should exert powerful pressure in a forward direction on the root of the tongue, but should not allow the tube, which is resting in the angle between the thumb and forefinger, to move in any deeper. It is very advisable during

this procedure to have the patient utter a continuous sound. This not only diminishes the tendency to pressure but also renders orientation much easier. The arytenoid cartilages now enter the field of vision, the posterior commissure, the vocal cords, and the anterior commissure. If at this time there is a doubt the surgeon should at once remove the tube and begin a fresh passing of the tube.

3. This, as I have said before, is merely a pushing of the tube deeper into the larynx. Have the patient's teeth properly protected with a good size pledget of cotton.

Some mistakes that may occur: 1. Improper anesthetization. 2. Excitement or fear on the part of the patient. He should be told that at the worst he will feel an unpleasant, but quite bearable pressure on the tongue, and that he must go on breathing quietly and regularly. In very difficult cases it is well at the first sitting to be content with a view of the arytenoid region, and to proceed with repeated examinations before going deeper into the larynx.

3. The patient must be told not to bend his head back rigidly, but should let it be in an easy and natural position. Do not let the patient slip forward on the seat, and then take up a position with the body inclining backward. In this position examination is almost impossible. The patient's position should be a straight one, with the back slightly curved. The surgeon should reduce, as much as possible, the time during which the tube is allowed to remain *in situ*.

4. The surgeon must avoid touching, during his examination, the posterior wall of the larynx, as in doing so he produces a violent coughing as well as a sensation of strangulation.

INDICATIONS.

Foreign Bodies: *Case 1*: W. E. T., a boy, 6 years of age, admitted to the University Hospital, May 18, 1908, with the history of having swallowed a nail two weeks previously. This nail on account of persistent cough and rise of temperature, although the child's general condition remained good, was believed to have entered the trachea. The physical examination demonstrated a small,, thin, dyspneic, exceedingly intractable colored child. The temperature, pulse and respirations were 101° F., 140 and 64 respectively. Marked limitation of expansion of the left half of the chest upon respiration, together with dullness on percussion, occasional rales, but practically absent breath-sound and vocal fremitus, especially posteriorly below the spine of the scapula, indicated the existence of stelectasis of the lung, particularly the inferior lobe on that side. Aside from the exaggerated respiratory movement and breath-sounds, the right lung was entirely normal. Cardiac action was rapid and weak.

A skiagraph showed very well the presence of a nail about 2.5 cm. in length, lying obliquely in the direction of the bronchus, head downward, between the fourth and fifth left costal cartilages at their external junctions.

Tracheo-bronchoscopic examination: Under chloroform anestresia, the Jackson tracheo-bronchoscope was readily introduced by direct vision through the larynx into the trachea, employing the separable speculum. The instrument was passed through the bronchial three as far as the bifurcation of the left bronchus, displaying normal mucous membrane

throughout. At that point, the superior lobe bronchus appeared entirely normal. The inferior lobe bronchus presented a lumen filled with yellowish-gray pus, pus being evacuated by means of suction pump and cotton carriers. For a distance of about 3 cm. above the surface of the pus the mucous membrane in addition to much congestion, swelling and inflammation displayed a pinkish, brownish, grayish coloration, evidently bordering on degenerative or necrotic processes. A careful search in a beautifully well lighted field failed to reveal the nail, which was supposed to have become imbedded and lost to vision in the markedly swollen mucous membrane. The child was taken home in fairly good health. Two months later had coughing spell and expelled tack.

The particularly noteworthy feature in the report and study of this case, is the beneficial influence which may have been exerted by the removal of the comparatively large quantity of pus from the lung in aborting or preventing further abscess formation.[1]

Treatment and Location of Strictures: 1. Those of the esophagus.[2] 2. Strictures of the trachea and esophagus, malignant, as well as benign. It has been said by one authority that ninety-five per cent of all esophageal strictures can be successfully dilated through the esophagoscope with practically no danger to the patient.

Removal of Benign (Papillomas) and Malignant Tumors: *Case 1*: M. C., aged 22; family history negative; usual diseases of childhood. Personal history: About three years ago noticed commencing huskiness in her voice, gradually increasing. Consulted doctor in Ireland, who advised her to have all the teeth of the upper jaw removed, as he believed this was the cause of her increasing aphonia; this was done. She consulted another Irish physician and he advised and performed a cauterization of the papillominous growth, marks of which can be plainly seen on laryngoscopic examination; no improvement. Upon bronchoscopic examination with Kahler's 11 mm. wide spatula, a small pea-shaped growth was brought into view, occupying middle position of the posterior commissure between the arytenoid cartilages. There was no inflammatory changes of the vocal cords discernable. Epiglottis normal, larynx and trachea normal, and for curiosity's sake we used the round Kahler bronchoscopic tube with extension, which allowed us to inspect the inferior lobe bronchus and the middle lobe bronchus on both the right and left side. These we found to be normal, with exception of slight congestion in the middle lobe bronchus. On her return to the office a month later we re-examined the larynx and trachea. Congestion had disappeared; papillominous growth had slightly increased in size. At this time operation would have been performed but owing to the fact that the young girl was menstruating it was deemed advisable to wait until the period had passed. On December 17 under 20 per cent cocain and adrenalin anesthesia by direct bronchoscopy with 11 mm. spatula, the papillomatous growth was removed with the Cordes curette with very little bleeding, and the stump touched with two applications of alcohol absolute.

NOTE: On December 19, the first visit after operation, patient informs me that she is entirely free from the sensation of smothering and great exertion in phonation, in other words, that while her voice is not by any means clear, it requires less effort upon her part to speak.

(To be continued).